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The Automatic Rating of Workmen

Springfield Armory's System—Men in Competition for Wage Increase—How the Number of Idle Hours Has Been Greatly Reduced

The United States Army at Springfield, Mass., has developed to a very high degree of usefulness the governmental system of rating workmen so that all increases in wages, all dismissals from employment, the individual standing of employees in relation to a standard and to one another are determined automatically. The personal equation is eliminated from the management; neither favoritism nor unfavorable prejudice can make itself felt, to help or to injure a workman. Up to a certain point the men are competitors among themselves.

The system constitutes an important element in the general efficiency work of the armory. It insures a concentration of labor of a degree well beyond that found in most private manufacturing establishments. The visitor

is impressed with the industrial discipline; the complete absence of idleness, of conversation between the men; the indifference to incidents foreign to the routine of the shop.

The natural first thought is that a government factory quite naturally assumes an atmosphere of strict discipline because its managers are regular army officers, who are accustomed to absolute obedience to their wishes on the part of their subordinates, under which conditions

the advantage over the works of a private manufacturer would seem to be large. An analysis of conditions proves that this is not the case. On the contrary the government shop is handicapped in various ways, especially in the matter of civil service. This excellent institution possesses features which operate against discipline. It serves to tie the hands of the management. Little option is given as to who shall be hired, and summary dismissal is often impossible, even where it may be wholly desirable. The handling of workmen must conform to the laws as enacted by Congress. The employees are not enlisted men. Their relations, man to man, with those in authority are much the same as in a private plant. A large measure of the success that has been attained at Springfield is, of course, directly attributable to the personality and the ability of the managing officers, but the statement would be equally true in a discussion of any system de-

signed to give the greatest possible production in an industrial plant.

The automatic rating of workmen is but one element of the shop efficiency system, but it is a very important one. Individual production being high, costs are correspondingly low. Under the present management, the cost of a standard army rifle has been reduced from \$15 to \$13.67, which is a record as compared with results obtained in the works of the private factories of this and other countries, and in government shops generally. Yet the men work only 8 hr. a day and are given 27 full days a year with pay, which expense for labor the rifle has to bear. And it should be added that the United States army rifle is conceded to be the finest military arm

of its class in use to-day.

The efficiency report is not new in itself. It has been used in government plants for several years. But its application and the methods employed in getting at the described results have been developed at Springfield with specialized attention until they yield accurate, unprejudiced information of inestimable value.

The efficiency of a workman is the combination of five elements, as will be noted in the illustrative

card. They are not of equal importance; each has what is known as its "relative weight." Attendance and application each have a unit of one, habits and adaptability a unit of two, and ability a unit of four. The total is efficiency on a scale of 100. The card has columns for the analysis of ability and attendance.

To consider the latter factor the sub-divisions are absence with leave, on account of sickness, without leave and without pay. In the illustrated card J. Smith was in the six months absent 14 days with leave, 20 days on account of sickness, 2 days without leave and 3 days without pay, a total of 39. The law gives him 15 days with pay in a year in addition to holidays, all of which count without demerit. Therefore, as J. Smith had had no previous absences with pay in his leave year, the balance against him is 24. The rule is that for each three days of absence beyond the 15, one demerit mark shall be regis-

Name	J. Smith										SCHEDULE			
Address	134 Blank St.										CLASS			
Original Appointment	May 22, 1912										HILL			
EFFICIENCY REPORT for the six months ending Dec. 31, 1912.												WATER		
Relative Weight	1	1	2	2	4	Scale, 100.	IN CONNECTION WITH ABILITY.			DAYS ABSENT THIS HALF YEAR.				
Grade and Compensation.	Attend- ance.	Appli- cation.	Habits.	Adap- tability.	Ability.	Effi- ciency.	Char- acter of Work.	Quality of Work.	Quantity of Work.	L.	S.	W.L.	W.P.	Total
	87	100	200	180	380	947	B.	Good	Large	14	20	2	3	39
Changes in	Designation, Toolmaker													
	Date, May 22 '13													
	State.													
NOTE.														
CHARACTER OF WORK.—A. Important or original work requiring administrative capacity or much thought and investigation.														
B. Less important and partially original work.														
C. Work of a routine character requiring care and accuracy but no special skill.														
D. Skilled labor.														
E. Messenger and watchman work.														
QUALITY OF WORK.—Excellent; very good; good; fair; poor.														
QUANTITY OF WORK.—Very large; large; average; small.														
REMARKS:														

Form No. 161.
6-18-1912-1000.

The Efficiency Rating Card to Determine the Status of Each Workman at the Springfield Armory

tered, and, in addition, there is a penalty of three demerits for each day without leave. Therefore the workman had seven marks plus six, and the 13 subtracted from the 100 of the attendance column, leaves him a balance of 87.

Application and habits are elastic factors. In practice a man is given full credit, 100 for application and 200 for habits, unless real reason to the contrary is known. As to adaptability and ability, the records of the employee's labor, especially if he is on piece work, serve to check any opinion favorable or otherwise which may have been formed by his superiors. In the case in question the man is given a full 100 for application, 200 for habits and 180 for adaptability. Ability is analyzed by the character of the work as specified at the bottom of the card and by the quality and quantity produced. J. Smith is given 380, the unit being 4, making his grand total of efficiency 947, or 94.7 per cent. This is his rating. By it we must abide.

The ratings are determined semi-annually. No one man makes the decision as to the various elements of the efficiency card. The matter is in the hands of a board consisting of the officer in charge of the shops, the assistant officer in charge, the general foreman in charge of the shop where the man is employed (there are two plants at Springfield known as the Hill shop and the Water shop) the assistant foreman in charge of the particular department in which the workman is employed and the chief inspector. Each of these judges has a more or less intimate acquaintance with the men and their individualities. The production records furnish important knowledge to the board. It is easily seen that injustice is practically an impossibility.

Rating of Men Includes the Foremen

The efficiency card extends to the assistant foremen. Each must secure results. He has no clerical duties to perform, but concentrates on the instruction of his men, on the maintaining of discipline, which means keeping his men working continuously, and on watching production in order that there may be no loss through work which cannot pass inspection. The attitude of the management toward these foremen is unusual. Many a shop superintendent would find it worth while to take a hint from this element of the system. As has been stated, the foremen are rated like the men. The deciding board consists of the officers in charge of the shop, the assistant officer in charge, the general foreman and the chief inspector. His pay is determined by his percentage of efficiency. If in reducing working forces a foreman is to be dropped, the low man in the list goes, the theory being that each is sufficiently versatile in his ability so that he can, if the need arises, be transferred from one department to another without interfering with the routine of production.

To be efficient he must make his department produce the predetermined quantity of accurate work. Few plants anywhere demand such fine limits of accuracy as those in practical every-day use at Springfield in the manufacture of army rifles, machine guns, bayonets, sabres, scabbards and other equipment of war. To prove the statement every part of every army rifle must be interchangeable in any other rifle of the model, whether it was made last week or five years ago. Practically all of the men are on piece work; the inspection department is maintained on a most rigid basis, as is demonstrated by the fact that one man in every eight is an inspector. Therefore, unless the work of each workman is gauged by the foreman at frequent intervals each day, he may become careless, and in consequence entail a loss to the armory and to himself. Each man is presumed to pay for work which he spoils, but this cannot save the government from loss, for the law reads that the financial penalty shall not exceed the workman's daily pay. In a few hours he could ruin the value of many days' wages.

The importance of attention to work is made much of by the armory. If workmen are observed to be talking too frequently, or otherwise unnecessarily idle or inattentive, they are given a demerit mark, which enters into their efficiency record. Moreover, the foreman is held fully responsible for such occurrences, and their repetition is considered *prima facie* evidence that his working force is unnecessarily large; that if the required output is achieved where idleness exists the transfer of a man or two to some other department can do no harm, providing that the standard of industry is maintained. So the cur-

tailment is made and the foreman is compelled to accomplish results with fewer men. It may be stated, however, that the knowledge on the part of the foremen and workmen that these penalties may be expected, makes the necessity of their enforcement a very rare occurrence.

On July 1 and January 1 of each year the list of men is made up by class and grade and percentage of efficiency. The system is inexorable. To be sure, an occasional exception may be made in the operation of the system. Annotations occasionally appear against the names of individuals on the list in the records of the management. For example, a highly skilled and faithful man may have dropped to the bottom of his class because of a serious unavoidable illness, such as pneumonia or typhoid. The long absence from labor was a serious matter. Knowledge of the man's previous record may show that apart from this enforced idleness his record has been exceedingly good. The management, therefore, may decide not to drop him in case a dismissal is to be made. But outside of such special cases the system makes no distinction. Illness is considered as a misfortune to the victim; a well man is a more valuable unit in the shop force than an invalid and in justice to the former he is ranked above the man whose health compels frequent absences.

Efficiency Cards the Basis of Wage Payment Changes

As to the wage rate, the efficiency list removes all causes of controversy. The workman enters the shops on his own basis of pay. If it is found that he is worth more money, the increase comes to him without his solicitation, or it may happen that his earning power is below that which he has claimed, and his pay may decrease as he drops to a lower class. Should a man ask for more wages he is told that changes are made semi-annually only. His card is referred to and he is informed frankly regarding the possibility which awaits him. His efficiency may be increasing, or it may be decreasing, or standing still. He cannot claim that he has been unfairly treated, for his record is as unprejudiced as if kept by an automaton.

He is working in competition with the men who are doing the same class of work. He makes his own record. If he is diligent, skillful, dependable, his standing is correspondingly high. On the other hand, if he is a chronic absentee; if his habits are not good, or if he is slothful his percentage of efficiency must be low. He may lose his position because he is at the foot of the list and is the first to be discharged, or his rating may fall so low as to place him in a lower class as to wages.

The percentage of idle hours of workmen has gone down tremendously under the Springfield adaptation of the rating system. The periodic "sickness" following payday is rare. Few men care to take unnecessary demerit marks. The wholesale desertion for an afternoon or a day which occasionally demoralizes a plant, because of a ball game or other outside event of exceptional interest, is practically unknown.

The rating system has an important place in securing flexibility of production; in other words, the capability of the works to carry an overload. At the present time the output of army rifles is 150 per day. Recently it was found desirable to increase production temporarily to 200, and the task was accomplished without adding to the working force or to the number of working hours. Each man willingly labored at increased pressure for the time being, without creating confusion, and of course, without decreasing the quality of the product. This is an essentially important factor in a plant which may be called upon at any time to speed up its production. The Springfield armory shops are equipped to manufacture 500 rifles per day of 8 hr. The machinery is always in complete readiness to be started up and full stocks of material are maintained for that purpose. In case of emergency everything would be in readiness to start manufacturing on a large scale, the existing force going on a basis of extreme production, keeping the output ahead of normal until the full complement of men were recruited. The discipline of the system would be invaluable in such an emergency.

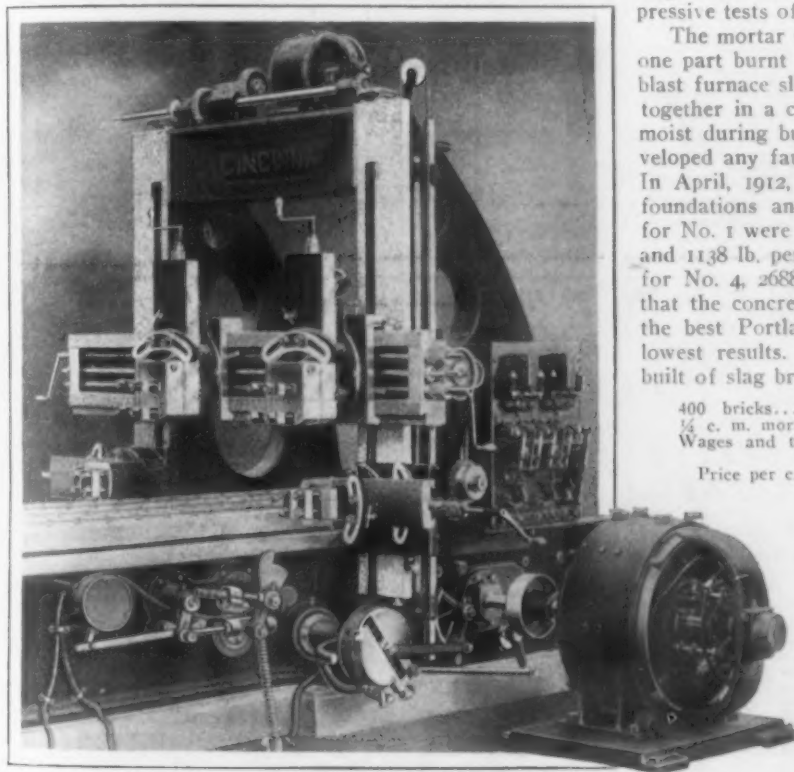
The effect of this efficiency system is shown in the close and intimate relations between the management and the workmen—and on account of this relationship, labor troubles are unknown. The commanding officer of the Springfield armory is Col. Wm. S. Peirce, Ordnance Department, U. S. Army.

A Reversing Planing Machine Drive

Ability to slow down the platen temporarily to a minimum speed for hard or high spots of the work being machined is a feature of the reversing-motor planing-machine drive developed by the Triumph Electric Company, Cincinnati, Ohio. Edging in $\frac{1}{2}$ -in. strokes, it is claimed, can also be easily accomplished, and an accurate stroke length to within $\frac{1}{8}$ in. on cuts of any length or speed is also available, a feature which, it is pointed out, is desirable when planing in pockets.

To convert the machine from a belt to a direct drive it is simply necessary to remove the overhead gears, belts, driving pulleys and the belt shifter. The motor can be coupled directly to the driving shaft or connected through spur or bevel gears as may be desired. A conveniently located controller is fastened with bolts to the housing on the motor side of the machine, and a small reversing switch which is attached to the side of the machine bed is connected to the tumbler by a rod. This tumbler by a slight movement enables the speed to be temporarily decreased and a master switch replaces the regular tumbler handle.

In starting the machine the operator turns the tumbler handle at the side of the machine in one direction slightly,



A Planing Machine Equipped with a Direct-Connected Reversing Motor Drive

the direction of motion of the platen being determined by the position of the tumbler. The length of the stroke, which can be varied from 6 in. to the full capacity of the planer, is limited by dogs, and the reversal is automatic. From 10 to 17 rates of speed are available, according to the size of the platen, on both the cutting and return stroke, the variation being secured by adjusting small rheostat arms on the controller panel, while the machine may be stopped quickly at any point of the cycle by a slight turn of the tumbler handle. It is stated that the operation of the mechanism is so rapid that when the dog throws the tumbler at the end of the stroke to reverse the motion of the table, only 1 second elapses between the throwing of the tumbler and the operation of the last switch for the reverse motion.

In a recent test of an 84-in. Pond planing machine, with a 40-hp. 230-volt reversing Triumph electric motor, having a speed range of 250 to 1000 r.p.m., on two 0.50 per cent. carbon steel billets, a $\frac{3}{4}$ -in. cut was taken by two roughing tools with a feed of $\frac{1}{8}$ in. and a cutting speed of 25 ft. per minute. In this test 56.3 cu. in. of metal or 16.3 lb. was removed per minute, which was at the rate of 6350

lb. per 10-hr. day. The total power input in making the cut was 44.3 hp., while the net power consumed in cutting was 38 hp.

The Utilization of Blast Furnace Slag for Brick

Stahl und Eisen for February 6 presents a short article on the utilization of blast furnace slag, referring particularly to slag bricks. These are now made by several standard methods, most of them involving hardening either in a steam chamber or an atmosphere of carbon dioxide. In the last few years experiments have been carried out at Creuzthal on the use of slag bricks for engine foundations that are of great interest from both a technical and economic standpoint. These foundations are:

1. For an 850-hp. gas engine dynamo, made in 1907 of concrete, 1:7 mixture.

2. For a gas blowing engine furnishing 17,660 cu. ft. of air per minute, made in 1908 of slag bricks hardened in air. Compression tests of the bricks gave 1710 to 2130 lb. per sq. in.

3. For a similar blowing engine, made in 1908 of slag bricks hardened in a stream of carbon dioxide. Compression tests of the bricks gave about 3550 lb. per sq. in.

4. For a 2200-hp. gas engine dynamo, made in 1909 of slag bricks hardened by means of carbon dioxide. Compressive tests of the bricks gave about 3550 lb. per sq. in.

The mortar used for foundation 2, 3 and 4 consisted of one part burnt lime and 10 parts granulated foundry-iron blast furnace slag. These materials were carefully ground together in a chili mill, and the brickwork kept carefully moist during building and after being finished. None developed any faults nor has caused any delay in operation. In April, 1912, large cubes were taken from the various foundations and tested under compression. The results for No. 1 were 1124 and 981 lb. per sq. in.; for No. 2, 1166 and 1138 lb. per sq. in.; for No. 3, 2219 lb. per sq. in. and for No. 4, 2688 lb. per sq. in. It is interesting to notice that the concrete foundation, although it was made from the best Portland cement with a 1:7 mixture, gives the lowest results. The cost per cubic metre of brick work built of slag bricks, with bricks at 17 marks per 1000 is:

400 bricks.....	6.80 marks
$\frac{1}{4}$ c. m. mortar.....	0.80 marks
Wages and tools.....	3.70 marks
Price per c. m.....	11.30 marks

This equals \$2.05 per cubic yard. The corresponding cost of concrete foundations is then worked out, varying from 19.51 marks per c. m. for a 1:5 mixture to 12.14 marks for a 1:12 mixture.

Finally the results may be given of tests on cubes built up of slag bricks hardened by means of carbon dioxide. They were built on April 3, 1912, using mortar made as before, and were surrounded with moist sand which was moistened afresh each day for eight days. The results in lb. per sq. in. were:

	Test No. 1	Test No. 2	Test No. 3
May 3, 1912.....	2133	1835	1707
June 2, 1912.....	2290	2133	1920

The ratio of lime to granulated slag was 1:8 in test No. 1, 1:10 in test No. 2, and 1:15 in test No. 3.

No data are given as to the suitability of hardening the bricks with steam or with carbon dioxide, especially on the point whether carbon dioxide is more suitable for basic slags, and steam hardening for those higher in silica.

In the opinion of the German author these splendid results obtained at Creuzthal show that the making of slag bricks provides the most suitable and cheapest way to use blast furnace slag.

G. B. W.

Kieley & Mueller, 34 West Thirteenth street, New York, state that their specialties are now being handled in the West by the Kieley Steam Specialty Company, 1913 Fisher Building, Chicago, carrying a complete stock, which will enable prompt shipment to be made from that point. They also have representatives in other important centers. Their specialties are identified by the trademark Kilemul, which is cast on all of them. A new catalogue has been issued.

Cost-Keeping in a Pump Factory*

A System Designed to Give Accurate Information with Special Effort to Minimize the Clerical Labor Involved

BY STUART DEAN

In the shop with which the author is connected each lot of pieces to be made is given a job number. The workman gets the number from the job tag or instruction tag which is tied to one of the pieces of the lot. The foreman can get it from his machine order, and the cost department gets it from a carbon duplicate of the foreman's machine order.

Each workman is provided with a pad of blank time tickets with the hour and quarter-hours of the day printed in a straight line across the bottom. He places a cross on the hour or quarter-hour mark on the ticket that represents the time at which he starts the job, and another cross on the hour or quarter-hour mark showing the time at which he finishes the job. He draws a connecting line between

object must never be lost sight of. A firm with an enormous output per man and no cost system is better off than one with a fine cost system and a low output per man.

For each new job, the workman makes out a new time slip. At the end of the day the quitting time is marked even if the job is not done, and all the time slips for the day are sent to the cost department. The next morning the workman makes out a new time slip for the unfinished job, which will, of course, have the same job number as that of the day before. If the workman's starting time on one job does not exactly correspond to the finishing time of the previous job, the cost department will notify him, and the proper correction will be made.

A different colored time slip is used for each department

PUMP WORK		JOB Number	CLOCK Number	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
STUDDING	POLISHING	RINGS	2D ERECTION							
SEATING	GRINDING	LAYING OUT	PATCHING							
PLUGGING	FILING	LAGGING	PIPING							
TESTING	CHIPPING	TAPPING	2D TEST							
CLEANING	REAMING	SCRAPING	QUANTITY							
PACKING	KEYING	ASSEMBLING								
6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12				
1 1/2	2 1/2	3 1/2	4 1/2	5 1/2	6					
PUMP WORK. HAND YOUR TIME IN ON BLUE TIME CARDS. CHECK ONE OF THE OPERATIONS ABOVE			HOURS.	RATE.	VALUE.					

SHOP WORK.		CLOCK Number	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
CHECK THE STANDING ORDER NUMBER IN COLUMN BELOW.									
0 100 140 200 240 260									
CORE ROOM IRON FOUNDRY BRASS FOUNDRY PATTERN SHOP									
6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12			
1 1/2	2 1/2	3 1/2	4 1/2	5 1/2	6				
MAKE OUT YOUR TIME FOR STANDING ORDER NUMBERS. ON NOTHING BUT YELLOW TICKETS. FOR SHOP WORK, CHECK STANDING ORDER NUMBER.			HOURS.	RATE.	VALUE.				

Fig. 1—Time Slip for Assembling Work—Productive Labor
Fig. 3—Time Slip for Non-productive Labor

MACHINE WORK		JOB Number	CLOCK Number	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
ONLY OPERATIONS BELOW TO BE CHECKED. OTHER OPERATIONS NOT NOTED UNLESS FOREMAN SO ORDERS.										
Fitting Steam Rings to Steam Cylinders.										
Fitting Chest Pistons to Steam Chests.										
Fitting Rock Shafts to Stands.										
Rolling and Fitting Linings in Pump Cylinders.										
Reboring OLD Cylinders or Chests.										
MACHINE No.										
QUANTITY										
6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12				
1 1/2	2 1/2	3 1/2	4 1/2	5 1/2	6					
HAND YOUR TIME IN FOR MACHINE WORK ON WHITE CARDS.			HOURS.	RATE.	VALUE.					

WORK ORDER.	
JOB No.	_____
SIZE	_____ STYLE _____
PRODUCTION ORDER	_____ CORR. No. _____
DO THE _____ WORK ON _____	PIECES OF _____
THESE PIECES ARE SHOWN ON _____	
DRAWING No.	_____ CARD No. _____ AND ARE
CALLED THE _____	

Wt.	_____ 191 _____

Fig. 2—Time Slip for Machine Work—Productive Labor
Fig. 4—Work Order Form for Stock, Special Parts or Repairs

these two crosses. He also enters on the slip the job number, his own clock number and the date. If he is a machine man, he also enters the number of his machine.

He further checks off on time slip the operation that he performed, whether it be lathe, planing, milling or drilling work, if he is a machine hand, or tapping, scraping or studding if he is an assembler. This checking consists of drawing a line through the word. The system is simple to explain to the workman and simple for him to follow, for there is no writing connected with it.

The claim is sometimes made that the time would be more accurately taken by a clock, which automatically stamps the time of starting and finishing a job. The writer does not favor the use of anything that makes it necessary for the men to leave their machines every time they start a new job. We must remember that cost-keeping is of secondary importance. The profits are made at the points of the tools, and it is of the utmost importance to keep the men at their machines. That output is the main

to enable the cost department to separate at sight the slips of the various departments from each other. On the time slips there is also printed, for special work, a list of those departments that are likely to have work done for them, such as office, machine shop, foundry, pattern shop, yard, power, etc. To reduce the size of the time slips the department names are abbreviated, and a number of instruction sheets are posted under glass throughout the plant, explaining these abbreviations. When a man does a repair job for one of these departments, instead of writing a job number, he draws a line through the name of the department for which the work is done. The cost department then charges his time against that department.

In cost-keeping there must be a checking or proving that will detect any mistakes made either by the workman or in the figuring of the costs. The following is the method of checking used by us:

Checking Up Time Slips

1. All the time slips are assorted according to clock numbers (employees' numbers).
2. To detect the failure of any workman to send in

*Copyright, 1913, by Stuart Dean. Seventeenth article on Shop and Foundry Management. The sixteenth article, "The Machine Finishing of Cylinders," was printed in the issue of March 6.

his time slips, the clock numbers on the time slips are compared with a previously prepared list of clock numbers representing the men who should send in their time on slips. As soon as a new man sends in time slips, his name is added to the list.

3. Each day a list of those employees who should have sent in time slips but who failed to do so is made out. From the list those who were absent are struck off.

4. This list is then sent into the factory, and the missing time slips are collected.

Checking Hours and Wages

1. The hours and quarter hours, as put down by the workman in the shape of two crosses connected by a line, are entered in a space for this purpose on the time slip. This entry represents the time that was taken to do the job. For simplicity, no time is figured for less than a quarter of an hour. The amount of wages for the time represented by the slip is entered on the slip.

2. The total of each man's wages for the day, as shown by the time slips is compared with his wages for the day, as placed in the time book by the time-keeper. Two girls work together on this checking, one handling the slips and the other the time book.

are totaled in each of the classes and sub-classes of time slips.

A daily sheet is then made out on a printed form, Fig. 5. The above totals are all entered on this sheet, which gives the total number of hours for each department, and also the total wages for each department. It further gives the total amount of money spent for material for each department, and all other expenses connected with that department. That is, any money spent during the day, no matter for what purpose, whether for pay-roll, material, insurance, taxes or work done by an outside firm is placed on this sheet, charged to some department or to some division of the business. The items in these daily sheets added together make the monthly sheets. From them is made out the yearly sheet.

The principal object of this sheet is to show the proportion which the overhead, or non-productive, expense bears to the productive expense. This is the "pro-rate." Besides the pro-rate, this sheet gives the cost in each department, and thereby is useful to the manager or superintendent in keeping close watch of department costs.

At intervals the amount of non-productive labor sent to the office will have to be looked into, as there is always a temptation to send in non-productive time which could

[illegible]

Fig. 5—Reproduction of a 10½ x 17-in. Sheet Used for Distributing Daily, Weekly and Monthly Non-Productive Labor Charges

If the amounts correspond it shows that no mistake has been made by the workman, the cost-keeping department, or the wage pay department. Thus: the workman has made out his time slips correctly; his jobs do not overlap or fall short of each other; the starting time on his new job is the same time as the finishing time on the previous one; the cost-keeping girl has computed the graphically marked time of the workman correctly, and set it correctly down on the slips; the cost-keeping girl has calculated correctly the amount of pay due for the computed time and correctly entered it on the time slips. The time-keeper has correctly figured the man's time and wages and entered them correctly in the time book.

If the amounts do not correspond the mistake is located and corrected. If it is the workman's mistake the shop is notified, and the error is rectified.

Separating Department Charges

The time slips for each day are separated according to the following departments: Machine, assembling, erecting and non-productive. The non-productive slips are further separated into departments. The wages and hours

be charged to jobs. The writer knows of one case where the non-productive labor rose to 62 cents per hour, and was decreased to 42 cents per hour by carefully scrutinizing all non-productive time slips.

After all time slips have been separated according to departments, and non-productive hours and money have been entered on the daily sheet, the total number of hours are added together and compared with the total number of hours in the time book. These must correspond. This is the check to show that no person on the pay-roll has been missed, and that no labor cost that should have been charged to a department has been overlooked.

Apportioning Time to Job Numbers

All time slips are filed according to job numbers. The girl while doing this sees that the number of pieces worked on, as marked on the time slip, is the same as the duplicate machine order that was received on the job when it was started. When there is a difference, the time slips are sent to the shop for correction. This acts as a check. Sometimes workmen put down the wrong job number and the discrepancy in quantity will discover the mistake.

COMB.	CARD	MONTH		YR.		MONTH		YR.		MONTH		YR.		MONTH		YR.	
		START	FIN.	START	FIN.	START	FIN.	START	FIN.	START	FIN.	START	FIN.	START	FIN.	START	FIN.
SIZE STYLE PART	NO. OF PIECES																
	JOB NUMBER																
	MATERIAL AT RATE																
	TOTAL WEIGHT & ROUGH VALUE	LB.				LB.				LB.				LB.			
		MCH.	HRS.			MCH.	HRS.			MCH.	HRS.			MCH.	HRS.		
	ENG'N LATHE																
	J. & L.																
	CHUCK																
	BRASS																
	POLISH																
	BORING																
	PLANE, SHAPER																
	MILLING																
	DRILL																
	TAPPER																
	BOLT CUTTER																
ONE PIECE	MACHINE TOTAL	Hrs.				Hrs.				Hrs.				Hrs.			
	AS'D'L TOTAL	Hrs.				Hrs.				Hrs.				Hrs.			
	FLAT COST TOTAL	Hrs.				Hrs.				Hrs.				Hrs.			
	MACHINE	Hrs.				Hrs.				Hrs.				Hrs.			
	AS'D'L	Hrs.				Hrs.				Hrs.				Hrs.			
	ROUGH STORES	LB.				LB.				LB.				LB.			
	FLAT COST	Hrs.				Hrs.				Hrs.				Hrs.			

Fig. 6—Example of Flat Cost Card, 4 x 6 In. in Size

These time slips remain filed until the notification comes in that the job is finished.

Ascertaining the Cost of Individual Parts

The cost of an individual part of a machine is called the flat cost of the piece, and the cost card is known as the flat cost card. Each one of these cards has space on it for entering the itemized time and cost of the piece four times, which gives a chance for comparison. A new flat cost card for a certain piece is never made out until the last one is completely filled.

These flat cost cards are filed in boxes in the order of their combination numbers. The name of the piece, the combination number, and the drawing card number are written at the left-hand edge so that the cards can be rapidly handled. These items are copied from the machine order duplicate that has been filed with the shop-workman's time slips.

The combination number is the design number of one size of a pump as a whole, as it was built, and differentiates the size, style and design of the pump down to the smallest detail from all other designs, sizes and styles. Combination number 1900, for instance, by referring to the master production list or bill of material, shows us exactly what parts were used on the pump. No pump with combination number 1900 will be built any differently. If a slight change in the shape of any of the parts should be made on combination 1900 a new combination number would be given. The material may be changed in certain parts without a change in the combination number. Rubber valves may be changed for brass or a brass piston rod may be changed to steel. Or even a brass cylinder may be placed in the pump instead of cast iron, provided exactly the same design and pattern is used. Changing the material, however, without changing the combination number is allowed only on a few certain parts that are always specified by the customer in his original order.

When a piece, or a lot of one kind of pieces, is completely finished in the shop, the shop sends in the original machine order to the cost department stamped "Finished." When the cost clerk receives this original machine order stamped "Finished" he takes all the shop-workman's time slips, which have the same job number as the machine order, to his desk. These shop-workman's time slips have been gathered up daily from the workmen and have been accumulating in the cost department files while the job was in progress.

The clerk then takes to his desk the flat cost card, Fig. 6, having the same combination number, card, number and name of piece on it as the machine order which was marked "Finished." If no such card be found in the files, or if the card be full, a new card is started. The information on the shop-workman's time slips, and the machine order are now entered on this flat cost card.

The date, the quantity worked on, and the job number are placed at the top of the card. The material of which the piece is made, and the cost rate at which the material is figured are placed next. This last is done so that if material rates change in the future, the cards can still be used by making the correction. Next is entered the weight of the piece. All these items are copied from the machine order.

The weight entered is the rough weight before any work has been done on the piece. No credit is given for stock removed. When the piece is made from bar stock, the dimensions of the stock are entered on the machine order instead of the weight. The cost

department has tables for transposing these dimensions to weights.

The sequence of operations then is:

1. Separate from the others all the shop-workman time slips that have notes on them referring to bad workmanship or flaws in material. A special note is made of this extra time and extra expense, not on the flat cost card, but on the final cost of the machine as a whole, because it is assumed that this particular extra expense will not happen again. What is wanted on the flat cost is the true cost of the piece as it would have been had the work gone smoothly. This extra time and expense must not be thrown away, and therefore it is charged to the finished machine as a whole.

2. Separate from the others all the shop-workman time slips that have special notes on them referring to the number of pieces thrown out as bad. These notes are put on the flat cost card of the piece in red ink.

3. Separate the shop-workman machine time slips from the erecting and assembling slips. They are of different colors.

4. Separate the machine time slips so that all the slips of one man are together.

5. On the flat cost card, in the proper place, lathe, planer, shaper, etc., enter the number of the man's machine, the hours he spent on the lot of pieces, and also the wage cost on the lot.

6. Assort the hand work, or assembling slips according to the different hand operations, such as laying out, filing, tapping, studding, polishing, chipping, scraping, cleaning, piping, keying, testing, etc. Enter the number of hours spent and the wage cost for each of the above hand operations in the proper place on the flat cost card.

7. Total the machine hours and wages on the flat cost card and enter the amounts in their proper places at the bottom. Do the same with the assembling time. Add the total machine time to the total assembling time, and divide by the number of pieces in the lot. This is entered in the place marked "Hours on each piece." The same operation is performed with the wage costs. When done this cost card is filed in the flat cost card file according to its combination number and card number.

All erecting time on a machine as a whole is charged to the erecting job number of the machine. An erecting cost card is made out in the same way as the flat cost card for a piece.

The flat cost per pound should be placed on each flat cost card. Long time taken on a piece, wrong time sent in on a piece, mistakes in figuring the costs of labor and material then will be easily discovered. The design or the method of manufacture will be changed on all pieces that show a cost over a certain rate per pound. A marked reduction in the cost of the product can be made if the above is carried out.

Ascertaining the Cost of a Complete Machine

When the machine is finished, the bill of material is sent to the cost department marked "Finished." The cost department gets from the drafting room an exact duplicate sheet of this bill of material and the following routine ensues:

1. The cost department pastes at the right hand edge of the blank bill of material a large ruled and printed form (Fig. 7) made especially for the purpose of cost figuring.
2. All notes that the shop has made on the original bill of material are transferred to the blank bill of material. Next, all the machine job numbers are transferred from the shop bill of material to the blank list. Then all the items mentioned as being sent on the fitting list are entered.
3. All the flat cost cards are taken out of the files pertaining to this bill of material. Only those are used that have the same job number as the job number given on the bill of material. Where no job number is given it shows that the shop got the piece from finished stock. In this case the latest cost on the piece is used.

Next, all weight items from the flat cost cards for each piece, and also hours' labor for each piece, are entered. The columns are then added and the totals are entered. The adding machine is used on the long additions to save expense and to insure accuracy.

The final condensed cost of the completely finished machine is put onto a card about 4 in. by 6 in. On it are the following items:

- Size and style of machine and order number.
 - Machine labor value.
 - Assembling labor on parts, value.
 - Erecting labor.
 - Machine hours.
 - Assembling hours.
 - Erecting hours.
 - Total productive labor hours.
- The total productive labor hours are multiplied by the pro rate per hour, which gives the overhead expense that the machine has to carry. This value is entered on the card. The following items also appear:
- Value of purchased material.
 - Value of rough material.
 - Weight of cast iron castings.
 - Rate figured at cents.
 - Weight of brass castings.
 - Rate figured at cents.
- These items are put on so that if the rate changes the corrected cost can be figured.
- Weight of other material.
 - Rate figured at cents.
 - Painting and skidding.
 - Freight.
 - Weight of finished machine.

The hours of erecting can be sub-divided if the firm builds a machine that sometimes has extras, that at other times are omitted. The erecting of these extras can be kept separate and entered as separate item on the card. On the back of the card are written details that tell how the machine is built.

These main items are copied direct from the totals at the bottom of the large bill of material cost sheet, Fig. 7, excepting the erecting time and value. This is taken from the erecting flat cost card. The pro rate is figured from the yearly cost sheet, as previously mentioned.

All special notes are added to the cost card, such as time and value of extra machine work that had to be done after the parts were considered finished; testing and cleaning, second erection, second testing, pattern time and pattern labor cost. Where a machine is made by changing the pattern of some other machine, the cost of alteration should be added to the cost of the machine, as the customer should pay the expense of pattern changes.

Painting and skidding are taken from a separate flat cost card made out in the same manner as the other flat cost cards, and entered on the condensed cost card. The total cost is then summed up and entered on the same card. The selling price also is put on the cost card as is the profit and also the percentage of profit.

Use Made of Cost per Pound Records

After the total cost has been summed up the cost per pound is entered on the card. This is based on the net weight; that is, the weight without the skids. The cost per pound is useful as a rough check on costs. If the cost per pound on any particular machine is higher than the cost per pound of other sizes of the same style of machine, it is at once evident that something is radically wrong in the manufacturing, which must be corrected. The cost per pound is useful also in making estimates for new work. The setting of the selling price on a machine, the cost of which is not known, is a delicate undertaking. The price must not be so high that the order is lost, nor so low that money is lost.

Accurate selling prices can be made on machines where the cost per pound is known on similar machines. Where costs are hazy there is a temptation to sell at or below cost. A known cost of manufacture stops this.

The cost system described above is simple. Two or three girls can take care of the time-keeping and the cost-keeping for a firm employing two hundred men, and turning out a diversified product. No part of the cost-keeping system is carried on by any one in the shop. The cost-keeping is simply tacked on the shop routing system.

COST SHEET OF ONE COMPLETE APPARATUS											
Size 54 x 7 x 7 Style D F W A		PURCHASED FINISHED MATERIAL	ROUGH MATERIAL	VALUE MACHINE LABOR	VALUE ASSEMBLING LABOR	HOURS MACHINE LABOR	HOURS ASSEMBLING LABOR	WEIGHT CAST IRON	WEIGHT CAST BRASS	WEIGHT STEEL	WEIGHT TIN MAY
Comb. No. 165 Order No. 18,255											
165 1 Steam Cyl.											
165 2 Steam Piston Head											
4 1 Steam Cyl. Head (Fit to Cyl.)											
165 2 Steam Piston Follower											
165 2 Inside Packing Rings											
165 2 Outside Packing Rings											
230 1 Steam Chest Cover											
165 1 Slide Valve											
230 6 Valve Rod											
230 5 Valve Rod Head											
4 4 Valve Rod Stuff Box											
6 4 Stuff Box Gland											
6 4 Stuff Box Nut											
230 6 Piston Rod											
3 3 Steam Piston Rod Stuff Box											
3 3 Stuff Box Gland											
3 3 Stuff Box Nut											
165 3 Crank Shaft											
230 6 Crank Shaft Cap											
165 6 Links											
230 6 Link Stud											
230 6 Link Bolt											
230 6 Link Slide											
230 6 Link Slide Plate											
230 6 Crank Brass											
230 6 Crank Brass Slide											
165 6 Eccentric											
165 6 Eccentric Arm											
165 6 Eccentric Strap											
165 6 Rocker Arm											
165 6 Rocker Arm Upper Pin											
165 6 Rocker Arm Lower Pin											

Fig. 7—Part of Blank Used for Ascertaining the Cost of a Complete Machine

Figuring Pro Rate or Overhead Expense

From the yearly expense sheet, made out by the cost-keeping department, the pro rate is made.

One of two systems can be used for this charge. Either take a certain fixed percentage of the productive cost (labor plus material), make this the pro rate and add it to the productive cost, and call this the final cost, or we may add a certain fixed amount, so many cents, for each productive hour worked on the product. The amount to be added for each productive hour is taken from the previous year's proportion of total overhead expenses to the total number of productive hours for the whole year. For instance, suppose that total overhead expense for the entire year divided by the total number of productive hours was 45 cents. Then to get a true cost, to the flat cost of each productive hour 45 cents must be added to carry all the other expenses. The productive hours are those hours actually charged by the workmen to a particular piece or particular machine. The overhead expense means every charge of any kind, no matter what it be, above the productive labor and the material that is directly charged to the product.

This last system is the only correct one to use. It favors those jobs where the hours of labor are few as compared to material cost. It strongly favors those jobs that are completed in very short times. It thus encourages rapid work and makes it impossible to employ slow men in a plant.

A plant using the first mentioned pro rate system can increase its capacity by adopting the second system, because the second system favors work that takes few productive hours as compared to the material cost, and discourages the taking of orders having labor cost that is high as compared with the material cost.

A plant run to its maximum capacity has only a fixed number of hours that its men can put in on the work. Any system favoring the taking of orders requiring but an hour's work will increase the output of the plant and likewise the profits. A firm should make its main profit on the labor of its men, machine tools and plant, and not on the material it uses. The labor item is the output restrictor of a plant.

Firms engaged in a class of work where a large amount of material is finished by a small amount of labor can make money when selling their output at a profit of 5 per cent., because their tonnage output per year is enormous, whereas, a firm whose main expense is labor

would go into bankruptcy at the same low percentage of profit, their output being limited. The percentage of pro rate or overhead expense in a plant will increase as the output per workman increases, because:

1. The keeping of tools in a high state of efficiency and the employing of efficient foremen must increase expenses. Moreover, hard driven tools require constant repairs and replacement, and, furthermore, labor-saving devices, such as jigs, fixtures and special small tools, are expensive.

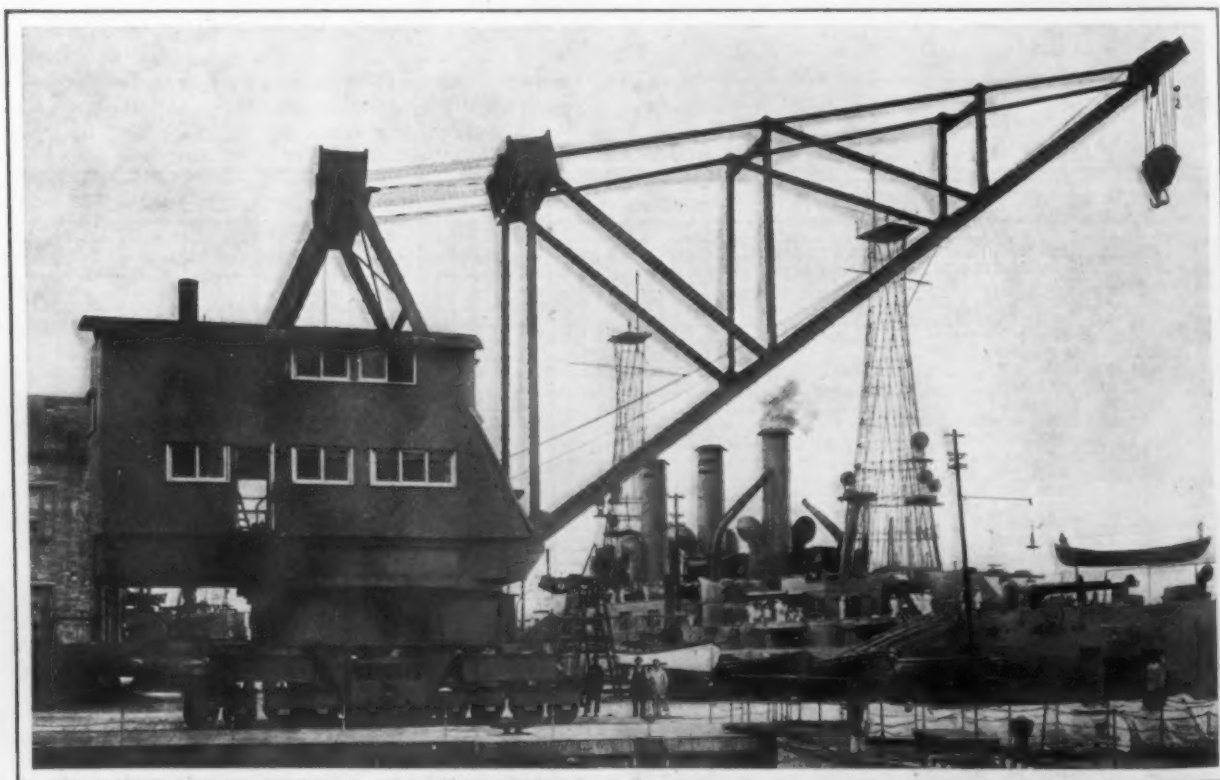
2. All reduction in productive labor means a reduction in the productive labor force. Each producer must carry more of the overhead expense as the force is reduced. It is possible to take a plant whose output of finished machines averages 44 lb. per day for each productive workman, and increase this average to 110 lb. per man for each day's work by improvement in design, changes in the amount of finish and methods of doing the work, by employing good workmen and requiring them to turn out a large output.

The overhead expense will be less on each machine turned out than it was before the plant output was raised, but compared to the productive labor expense, which has been reduced in amount, the pro rate will show up proportionally higher, all on account of good management. Take the imaginary case of a firm equipped and managed so well that its whole output was turned out by one productive workman. This one man would have to carry the whole overhead expense. It stands to reason that his pro rate per hour would be something enormous.

The best way to watch the overhead expense, in order to keep it down, is to compare the year's total expenditure for each item with the corresponding expense of the preceding year. When considering whether it would be cheaper to buy certain parts of the product already finished, or make these parts in the shop, use the flat cost, without the pro rate added. The pro rate is a charge that the customer must pay so that the overhead expense of a plant may be taken care of.

A 50-Ton Locomotive Jib Crane

An order for what is believed to be the largest locomotive crane in the country has been recently received by the Browning Engineering Company, Cleveland, Ohio, from the United States Government. This crane, which is to be delivered in about nine months for use in the United



The Largest Locomotive Crane in the United States, Capacity 50 Gross Tons at a Radius of 70 Ft., Now Being Built for the Navy Yard at Brooklyn, N. Y.

States Navy Yard, at Brooklyn, N. Y., will be similar to the 40-ton crane shown in the accompanying engraving, with the exception of the boom construction. At the present time, there are two of these 40-ton cranes in service in Government navy yards, one being installed at Portsmouth, N. H., and the other at Norfolk, Va.

This crane is to be used for handling the cage type masts of battleships in one piece instead of dismantling them and handling them in two or three sections as was formerly the case. The height of the masts is governed by the distance from the high tide water level to the underside of the river span of the Brooklyn Bridge, 135 ft., to enable the battleships to enter the Brooklyn Navy Yard. The handling of these masts in one section will, of course, reduce the amount of time required for overhauling the vessels. In addition to handling the masts, the crane, which will travel around one end and two sides of the dry dock, will also handle boilers, machinery, armor plate and ordnance.

The crane which is to be built will have a maximum radius of 123 ft., at which distance it will be capable of lifting 15 gross tons to a height of 83 ft. The loads which can be lifted at 85 and 70 ft. are 40 and 50 gross tons respectively. The main boom will have an auxiliary one on the end, which is controlled by machinery and counterweights on the body of the crane. The boom will be hoisted by 30 parts of 1-in. plow steel rope, both ends of the cable being wound on a drum 24 in. in diameter, which has smooth turned scores to receive the rope. The crane will be mounted upon 16 wheels, 30 in. in diameter, with rolled steel double flanged tires and fastened to the axles by keys. The wheel gauge is 18 ft. and the wheel base is 29 ft. 9 in. The crane will travel at the rate of 120 ft. per minute and will make a complete revolution in 2 minutes. The weight in working order is approximately 500 tons. The cost of this crane was estimated by the Government as \$50,000, and all the material entering into the construction of this crane will be subjected to inspection and accepted by Government officials before it is fabricated.

How Ball Bearings Save Power

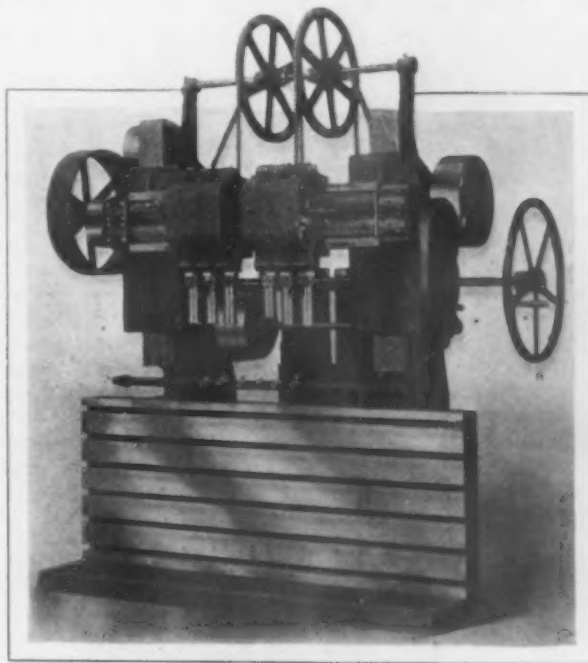
According to the London Times Engineering Supplement, a series of tests was recently carried out in order to ascertain the exact saving in power effected in one of the very few textile factories the line shafts of which have been equipped with ball bearings throughout. These bearings were of a well-known make with two rows of balls in each, arranged to swivel bodily in their race so as to allow for any flexing or mal-alignment of the shaft. Electric power readings were taken under exactly similar conditions before and after the ordinary bearings had been replaced by ball bearings, and the result showed a saving of 30 hp. at the engine in a weaving shed containing 900 looms. Had it been possible to eliminate the belt and rope friction, the actual percentage of saving of friction indicated in the bearings themselves would doubtless have been very considerable. A test carried out on an edge-trimming machine shaft in a boot factory, the ordinary bearings in which had been replaced by an equal number of ball bearings, showed a saving of 80 per cent. in the power required to drive the shafting.

It may be added that the speed of rotation does not affect the efficiency of ball bearings, and that the friction at starting is practically the same as when running. This is an important consideration in large factories in which a fraction of a minute saved in running the machines up to speed after each stoppage will result in an appreciable increase in the total output from the machines.

The Detroit Twist Drill Company, Detroit, Mich., calls attention to an error which found its way into *The Iron Age* of March 20 on page 749. The statement was there made that "the plant formerly occupied by the Detroit Twist Drill Company at Bellevue and Warren avenues, Detroit, has been sold to William F. Evans," etc. The plant referred to is the one formerly occupied by the Michigan Twist Drill Company. The Detroit Twist Drill Company occupies its own new building, which it especially constructed for its own requirements in 1907. This company is the originator of the Graham grooved shank system chucks and drills.

Railroad Frog and Switch Drilling Machine

For drilling railroad frogs and switches after they have been assembled, the Moline Tool Company, Moline, Ill., has brought out a new vertical drilling machine. The general features of this machine are the same as the company's standard line, but the construction is much more



A Recently Developed Machine for Drilling Assembled Railroad Frogs and Switches

massive than anything which has been brought out heretofore. A vertical face plate, to which the frog after the various members are clamped together can be attached ready for drilling, is regularly furnished. The heads which are bronze bushed steel castings are arranged to be clamped in groups with a device for traversing each group, or they can be set solidly together as the work in hand requires. Exceptionally large thrust bearings are provided for the spindles which can be adjusted to any distance from 4 in. to 5 ft. The upper spiral is driven by a belt at the left end, the lower one being driven from the upper through spur gearing. The feed mechanism consists entirely of steel spur gears with cut teeth. A hand-wheel provides a quick advance and return for the spindles. The travel of the rail is about 24 in. and the approximate weight of the machine is 12,000 lb.

Crawford Sectional Japanning Ovens

The duties required of ovens for baking various japans and lacquers, for bluing screws, drying, etc., are widely divergent so far as temperatures desired are concerned. Two things, however, are universally sought, namely, economy of fuel and thorough insulation of the oven. In these respects it is claimed for the Crawford sectional oven manufactured by the Oven Equipment & Mfg. Company, New Haven, Conn., that it has in its several types shown high efficiency. The heating unit of these ovens is an inclosed flame gas burner, adapted to burn city, natural, gasoline and producer gases. Air from a positive blower is forced into the burner, supplying oxygen in such amount as to effect perfect combustion of the gas used as fuel. After being highly heated in the burner it is forced into the oven and there circulates rapidly to all parts, giving an even temperature throughout. The rapid circulation of this preheated air promptly removes fumes from surfaces that are japanned or lacquered and ejects them at the oven vents, thus assuring uniformity of color and bright work. The sectional construction of these ovens allows their installation in cramped quarters with ease, while even unskilled workmen can put up the largest and have it operating in a few hours. It is light, and no special foundation is required. Contraction and expansion are provided for at all temperatures for which the oven is rated. There is no opening of joints, hence no consequent heat losses.

New Automatic Screw Machine Drive

The Substitution of Gears in the Base
for Belts the Conspicuous Feature

To eliminate the difficulties formerly encountered in driving single-spindle automatic screw machines with two or more belts from an overhead countershaft, the Brown

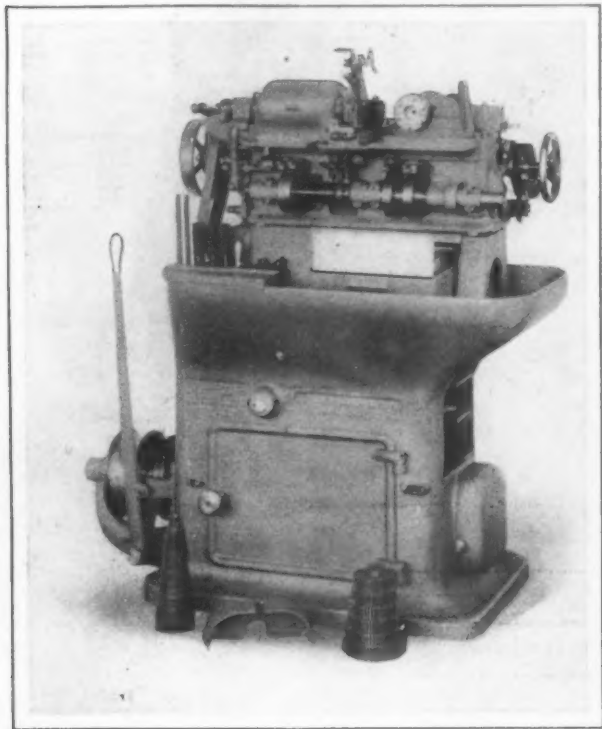


Fig. 1—An Automatic Screw Machine with a New Drive in Which the Overhead Countershafts and the Numerous Belts Have Been Eliminated

& Sharpe Mfg. Company, Providence, R. I., has made a departure in designing its No. 00-G machine. Ordinarily one belt is required for the feed mechanism, with one or two for driving the spindle and sometimes an additional one for the oil pump. This required two countershafts, one driven at a constant speed from the main lineshaft and the other which was driven at a variable speed from the first shaft. The feed mechanism was belted to the constant-speed countershaft and the spindle to the variable-speed shaft, the necessary changes in the speed of the spindle being made by shifting the short connecting belt on the cone pulley. This arrangement of overhead shafting for each machine, it is pointed out, required a large

amount of space on the ceiling, as well as giving a considerable expense in the installation and maintenance of a number of loose pulleys, hangers and belts. At the same time, the shifting of the cone pulley belt to give the speed changes was rather unhandy, on account of the shortness of the belt and the way in which the shifting had to be done. Fig. 1 is a view of the machine, while details of its construction are given in the two drawings, Fig. 2 being a section parallel to the floor which shows the arrangement of the main driving shaft and the speed change gears and Fig. 3 an elevation of the left end of the machine that gives the arrangement of the spindle driving pulleys and belts.

The machine is of the constant-speed type and will handle bar stock up to a maximum diameter of $5/16$ in. and it turns any length to $1\frac{1}{4}$ in. The driving pulley is located at the extreme left of the machine, and the speed-changing mechanism is inclosed in the base. As the driving pulley is equipped with a friction clutch, it is possible to drive the machine from either the main lineshaft or a jackshaft, as may be preferred, and it is also possible to equip it for motor drive. The placing of the spindle driving belt in the base of the machine permits the pulleys and the clutch to be completely shielded by a hinged cover, so that the operator can work from any position around the machine in making adjustments of the tools or inspecting the work with comparative safety. Another advantage claimed for this feature of inclosing the belts by a guard within the base is that they are thoroughly protected from the bad effects of the cutting lubricant. The cabinet type of base, which contains the entire spindle driving mechanism, adds to the rigidity of the machine and reduces to a minimum any vibration that might be caused by the rapidly revolving spindle. Emphasis is laid upon the fact that the entire mechanism has been designed with ample proportions to withstand the most severe service to which a machine of this size and capacity could be subjected. Phosphor bronze bushings are used for the bearings in the spindle drive, and in a number of cases the shafts are of hardened steel. In addition to the adjustable guard over the pulley of the main driving belt already referred to, there are hinge covers over the feed shaft on the back of the machine and over the spindle drive on the top, and care has been taken to protect the operator from injury and the machine from dirt and chips.

The pulley *a*, Figs. 2 and 3, which has bronze bushings, runs loosely on the shaft *b*, Fig. 2, and transmits power to the machine. The friction clutch located within the pulley is operated by the lever at the left of the machine. Fig. 1, and engages or disengages the pulley with the sleeve *c*, Fig. 2. This pulley is keyed to the shaft *b*, thus starting or stopping the machine. An important feature is the placing of an adjustable screw in the side of the starting lever, so that when it is moved to disengage the clutch, the screw slides upon the swinging brakeshoe *d*, Figs. 2 and 3, which is faced with leather and bears against

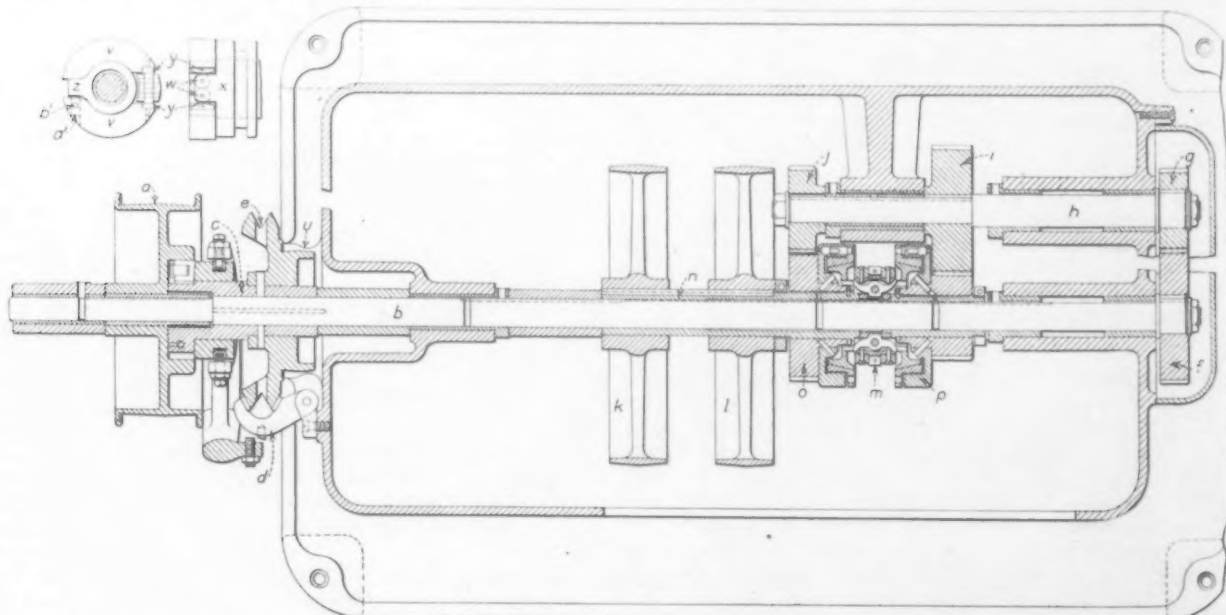


Fig. 2—Section Through the Main Driving Shaft Showing the Arrangement of the Various Gears and Pulleys

the tight pulley *c*, Fig. 2. In this way it not only acts as a brake to stop the spindle quickly but as a lock for the mechanism when the speed change gears are being re-

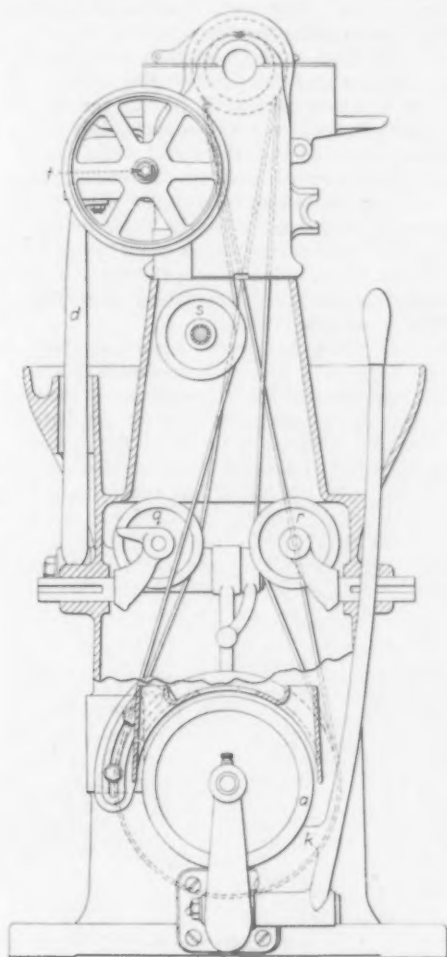


Fig. 3—Elevation of the Left End of the Machine

moved. With the exception of the gear *f* at the end of the shaft *b*, which meshes with the gear *g* and in turn drives the shaft *h* and the two gears *i* and *j* that are keyed to it, none of the gears or pulleys are fastened to the shaft *b*. The pulleys *k*, Figs. 2 and 3, and *l*, Fig. 2, and also the clutch *m* are keyed to a sleeve, *n*, on which the gears *o* and *p* run freely, the whole sleeve being loose on the shaft *b*. When the clutch *m* is engaged with the smaller gear *p*, the pulleys are driven at high speed, while by shifting to drive by the larger gear *o* a slower speed in the same direction is obtained. The pulleys *k*, Figs. 2 and 3, and *l*, Fig. 2, are connected to the spindle by an open and a crossed belt respectively. These belts are guided by the idler pulleys *q* and *r*, Fig. 3, which also act as tighteners, the adjustment being made by sliding the round shanks of the pulley brackets backward or forward through their bearings in the bed and clamping in the proper position with set screws. The arrangement of the spindle driving belt and pulleys is clearly brought out in this drawing, *s* being a guide pulley.

The spindle pulleys are free upon the spindle and are engaged or disengaged by a clutch similar in design to that shown at *m*, Fig. 2. The throwing of this clutch reverses the spindle, while the operation of the clutch *m* changes the speed from fast to slow or vice versa. It is emphasized that this combination of automatic spindle reverse and automatic speed changes is advantageous in threading, drilling with small drills or turning work having both large and small diameters, where the best results are obtained by using a different speed, either faster or slower, on certain operations from that used on the remainder of the work. Variations in the spindle speed are obtained by removing the two gears *f* and *g* which are held in place by nuts and substituting pairs having different ratios. As these gears are located on the end of the base, they are readily accessible and are completely shielded when running by a hinged cover. Easy access to the driving mechanism is afforded by a large door in the base.

Power for the feeds and the movements of the machine other than the revolution of the spindle is secured from the constant-speed shaft *t*, Fig. 3, at the back of the machine. This shaft is driven by a belt from the pulley *u*, Fig. 2, and can be stopped by the small lever at the left side near the spindle, Fig. 1. This action disengages a positive clutch between the shaft and the pulley, thus stopping the entire feed mechanism. The front or timing shaft is driven from the constant-speed shaft in the rear through a worm and worm wheel and change gears which, it is pointed out, positively regulates the duration of the cycle of operations. The timing shaft carries the cams feeding the cross slides and also three carriers on which are mounted adjustable dogs. These dogs trip levers extending under the bed and cause them to engage positive clutches on the constant-speed shaft at the rear, which in turn drive gearing or cams for performing the various operations. These clutches will release automatically after either a whole or a half revolution has been made. The clutch *m* that controls the spindle speed changes is automatically shifted by a lever on the back of the base and is thrown backward or forward by a cam on the feed shaft which is revolved by a clutch as has been previously described. The first half-revolution of this cam clutch throws the lever for one speed, while the second half shifts it for the other one.

The construction of the friction clutch in the main driving pulley, which is shown in the upper left corner of Fig. 2, is of an entirely different design from that ordinarily employed in constant-speed driving pulleys. The split friction ring *v* is expanded within the driving pulley by two hardened rollers *w* which are carried in the outside sliding sleeve *x*. These rollers bear against the hardened shoes *y* of the friction ring, the bearing surfaces of the shoes being arcs of circles. The inside sleeve *x* is keyed to the driving shaft and is connected to the split ring by the extension of a section of the sleeve into a recess in the ring. As the sleeve *x* is moved toward the friction ring by the fork on the operating lever, the rollers are forced between the shoes, thus expanding the ring sections and clamping the pulley to the shaft. As the sliding sleeve transmits no power, it is pointed out that it is free from any tendency to bind. When in position, the sleeve is locked as the rollers lie beyond the center line of the arcs. The rolling contact, while providing a powerful expansion, requires very little effort to operate. The screw *a'* which is held in place by the set screw *b'* adjusts the amount of friction.

Diesel Engines of Large Size

W. R. Haynie, 30 Church street, New York, United States representative of Usines Carels Frères, Ghent, Belgium, recently sold to Phelps, Dodge & Co., 99 John street, New York, for installation in one of their Arizona mining properties, two 1000 hp., 2 cycle, 4 cylinder Carels stationary Diesel engines. These engines are intended for direct connection to 60 cycle alternators to operate in parallel and are guaranteed to deliver 1000 hp. at an elevation of 6500 ft., using not to exceed 0.48 lb. of oil per b. h. p. hour.

Mr. Haynie says: "This is the first sale of a Diesel engine of larger than 225 b. h. p. units and is also the first 2 cycle Diesel engine ever sold for installation in the United States. Large engines of this type are in use in Europe, where many engines have been installed in territories that do not produce any oil; for instance, in Brussels and Paris electric plants have installed 1000 hp. engines of this type and the Havre plant has purchased 2250 hp., 2 cycle Carels-Diesel engines. The Bucharest plant has a number of 700 hp. and one 2250 hp., 2 cycle Carels engines, while a number of other cities have purchased large 2 cycle Diesel engines through other manufacturers of Diesel engines, thus committing themselves to a firm belief in the adaptability of the large Diesel engine to central station work."

In a new booklet of 48 pages the Titanium Alloy Mfg. Company, Niagara Falls, N. Y., gives testimony from steel manufacturers and others as to the results secured by the use of ferro carbon-titanium in the manufacture of steel. The statement is made that in 1910 the output of titanium treated steels was 326,300 gross tons; in 1911, 410,600 tons, and in 1912, over 550,000 tons.

Iron Breakouts in Blast Furnaces

An Analysis of Their Causes and a Discussion of the Latest German Methods for Their Prevention

Stahl und Eisen for January 23 presents a paper on methods for preventing iron breakouts by Engineer R. Kunz, of the Georgsmarienhütte, together with a very interesting discussion. The reason for the paper as given by the author is the occurrence of many breakouts at his plant, some of them threatening in character, coming when the furnaces were changed from a Bessemer iron to one low in silicon for the open hearth. Nothing could be found in the literature of the subject, which was scanty, on which to base experiments. Blast or gas breakouts are referred to briefly, and the writer gives his experience at Pueblo, Col., where one occurred, killing four men the first shift he worked. He considers these breakouts to be due in the United States to the small bricks that are used and the insufficient reinforcing around the bosh. Slag breakouts are disagreeable, but scarcely ever dangerous. It is exactly the opposite with iron breakouts, especially when the metal comes in contact with water, so that this possibility must be especially guarded against.

The greatest danger arises when the molten metal penetrates moist brickwork or wet rubbish near the furnace, or comes in contact with confined water. At Georgsmarienhütte the hearth block was surrounded by brick work built of slag bricks, which are very porous, and which soaked up the cooling water used on the furnace. If the iron worked through the hearth into this moist brickwork, the most dangerous explosions were the result. To avoid them Mr. Kunz removed this slag brick work when a furnace needed relining and replaced it by a heavy ring of hard burned firebrick construction, one meter thick, held in place by steel bands. Other improvements were made, but thus far the furnace has not been put in blast and their value is not known.

The "Billet Armor"

The writer then reviews a recent paper by Professor Donath and takes exception to the statement that iron breakouts are seldom observed with furnace making white iron, but more frequently with those producing very gray irons, spiegeleisen or ferromanganese, which work at higher temperatures. Mr. Kunz believes exactly the reverse, and his opinion is confirmed by others. Notwithstanding the higher temperatures at which furnaces work when making gray iron, so much graphite is deposited on the furnace walls that it forms, so to speak, a large graphite crucible, thus giving an added protection against breakouts. With a change to white iron the graphite covering is consumed, and breakouts again occur. This was very evident with Furnace 3 at Georgsmarienhütte. No breakouts occurred so long as it was making hematite, foundry, 12 per cent. spiegel and Bessemer iron. Operating conditions necessitated a change to low silicon open-hearth iron when breakouts were quickly noticed. With a change to gray iron they again stopped altogether. The various hearth constructions are then briefly mentioned and the conclusion is reached, together with Professor Donath, Doctors Lürmann and Bosse, that no certain method has yet been devised which, in the long run, will completely prevent iron breakouts. The well-known "billet armor" for the hearth is also discussed at some length with the theoretical reasons for the good results it gives. The principle appears to be that the large amount of metal around the hearth and bottom block, cooled by water, keeps these parts cool. The original duty of the inner reinforcement was only to hold the brick work solidly together. It readily conducts the heat from the bricks to the billets, and these in turn to the water so that the heat is quickly led away from the furnace. The outer reinforcement serves merely to hold the billets in place. If this reasoning is correct, the packing of the spaces be-

tween the billets with a bad conductor like coke breeze, clay, etc., is wrong, for they prevent the billets being plentifully covered with water. On the other hand the more free the billets remain the more surface they offer for the exchange of heat. The view sometimes expressed that when a breakout occurs the large mass of metal in the billets freezes the iron, and so restricts or stops the flow, is not confirmed in practice. Once the metal has worked through the billet protection it is not restricted, but the flow continues so long as there is metal left in the hearth. There is the objection that the metal often works through in a tortuous manner; that the outer opening can be stopped, but the inner one cannot be reached. It is not long before the metal again works through and this continues until the outer opening is made so large that the inner one can be found and stopped up. This difficulty can probably be obviated by making the "billet armor" easy to take down and replace.

There is complete agreement regarding the importance of tight close-fitting brick work in the hearth and bottom block, held together solidly by some reinforcement. Small breakouts may be noticed shortly after the furnace is put in blast, but they stop as soon as all the joints are filled with frozen metal, provided that no further joints or cracks develop. In general it has been found that in the long run none of the materials used can withstand the thermal and chemical conditions in the hearth. In a proportionately short time they are eaten away, and it depends more or less on good luck whether breakouts occur

the bad results usually obtained can be guarded against. The rubbish unavoidably produced around a furnace should be removed as quickly as possible, the water used for cooling purposes should be conducted away in water-tight channels, and every precaution taken to keep all the brick work around the furnace solid and dry. In this way there will be no wet material for the iron to penetrate or confined water with which it can come in contact.

A Cast-Iron Hearth Water Cooled

Finally, Mr. Kunz gives his proposal which is shown in the illustration. The walls of the hearth are the weakest part and require more attention than the bottom block. There is a heavy water-cooled cast-iron hearth. The water is started when blowing in the furnace, and a lining is formed by the furnace operation itself. If it appears too thin then more water is used, and the metal held in the hearth before tapping until the proper thickness of metal has been built up. The cooling water is collected in the cast-iron channel shown and led quickly from the furnace, no opportunity being given for it to be absorbed by the brick work. The tapping hole is to be made up with fire brick or carbon bricks before blowing in, and after tapping is renewed with the mud gun just as at present. The cinder notch is to be set directly in the cast-iron hearth.

Discussion

The paper gave rise to a long discussion. The first speaker told of the extremely good results he had obtained from the "billet armor" and considered it the best protection known against breakouts. He was followed by E. Hiertz, of Seraing, who considered that all types of reinforcement are good which are strong enough to prevent openings of the brick work at the joints, and would permit of water cooling being used. In order to protect the tapping hole an arrangement has been adopted which he noticed on a visit to South Russia in the autumn of 1912. Water-cooled cast-iron plates are built in right, left and underneath the tapping hole. They are 27½ to 31 1/3 in. high, 19½ to 23½ in. wide, with ¾-in. pipes cast in them, and are embedded in the "tar material" of which the tap hole is built. Although Bessemer and moderately low-silicon irons are made in South Russia, no accidents have occurred, probably because the black "tar material" resists the action of the iron very well. The six furnaces at

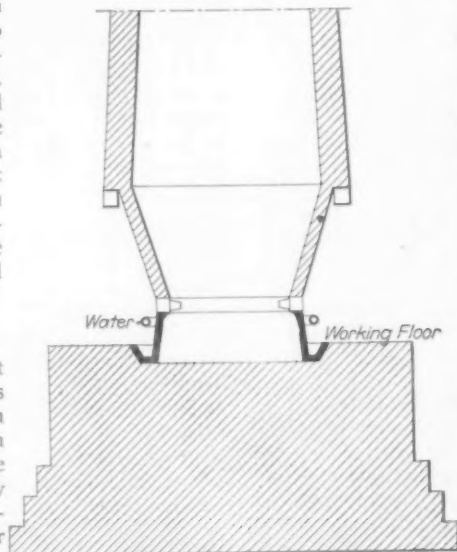


Fig. 1—Design for New Blast Furnace Hearth

Seraing have been equipped with this arrangement, and so far have given very good results.

B. Amende, of Hubertushütte, had obtained very good results by surrounding the zone in which breakouts occurred with a riveted ring of steel plate, leaving a space about 16 in. wide, which was rammed solid with a mixture of ground-up coke breeze and graphite, with enough tar to make it plastic. This method was adopted from Kladno. J. Amende, of Julienhütte, adopted a similar method but used a filling of loamy sand stamped into place with red hot rammers. Four furnaces are now provided with this protection. The next two speakers gave a method which they had found very successful in preventing tap-hole breakouts, namely, having a continuous stream of cold air playing upon the tap hole either from a spray nozzle or a simple pipe somewhat flattened at the end. One of them also gave in detail the construction of hearth and bottom block used on his furnaces with good results. K. Herr, of Ruhrort, spoke of the importance of the slag in iron breakouts, because of the strong chemical effect it may have on the brick work.

G. B. W.

The Welsh Tin Plate Industry

An article in the London Economist of March 15, discussing the Welsh tin plate situation, says:

Since 1910 there has been a rapid decline in the exports of tin plates from the United Kingdom to the United States and Canada. In that year our exports of tinned and black plates to those two countries amounted to nearly 100,000 tons; in 1912 they only just exceeded 9000 tons. For January and February this year they amounted to 1800 tons. The relation of these returns to the tin plate export trade as a whole may be judged from the fact that, whereas in 1910 the United States and Canada took over 20 per cent. of the total quantity exported, in 1912 the proportion taken by them was less than 2 per cent.

Whether the causes which have led to the capture of the North American trade by the United States are permanent or temporary it is impossible at the moment to determine. But it is believed by Welsh tin plate manufacturers that large quantities of tinned plates have been disposed by the United States manufacturers both to the American exporters of canned goods and to Canada at less than cost price. [This is probably an incorrect supposition. Editor *The Iron Age*.] To this extent the situation is an artificial one, but during the past few years the expansion in the production of tin plates in the States (as well as in Wales) has been enormous.

The American expansion has been due partly to the installation of new plant and partly to more settled labor conditions. In 1900 the quantity of tin and terne plates produced in the States was just over 300,000 tons; in 1910 it amounted to nearly 725,000 tons, and in 1912 it is estimated at nearly 900,000 tons. This increase has evidently outrun domestic consumption, and the American manufacturers have sought an outlet for their surplus in the markets most accessible to them. They will probably make every effort to retain the markets they have gained; how far they will succeed will depend ultimately on the quality of the plate they will be able to produce and on the competitive price at which they will be able to sell, but the great increase in the productive power of the American mills and tin houses has made the United States a serious factor.

Meanwhile, British trade with other foreign countries and British colonies has been increasing rapidly. In the Swansea district more capital has been expended during the last six or seven years on new plant than in any other corresponding period in the history of the industry, and the trade lost 15 years ago, when the American home market was closed by a prohibitory tariff, has been far more than made up by trade with new markets. In 1912, despite the heavy decrease in the shipments to the States and Canada, the total exports of tin plates from this country were down only 3420 tons, or less than 1 per cent.; but the recent extension in plant has caused the supply for the time being to overtake the demand—warehouses are overstocked and manufacturers have been compelled to close down some of their mills and to give notices to most of their workmen. The war in the Balkans is responsible for a falling off in the shipments to Roumania and other parts of southeastern Europe.

Additional Ryerson Warehouse Facilities

For the purpose of meeting the increased demand for reinforcing steel bars, particularly heavy at this time of the year, and in order to render that service with the same facility that other products are handled, Joseph T. Ryerson & Son have just completed an extension bay, 75 ft. x 200 ft., for the exclusive handling of plain and twisted bars. This additional bay is traversed by a 10-ton Pawling & Harnischfeger crane equipped with two independent 5-ton hoists. At one end material may be delivered directly into cars on track and at the other end a team platform, large enough for the accommodation of three or four teams, is provided.

For the racking of the bars of various sizes, an arrangement has been devised consisting of two parallel concrete cases for each general group of bars, cast in the floor with circular sockets in which 5 in. wrought pipe lengths are inserted in a vertical position, the pieces of pipe standing about 8 ft. high. There are thus two rows of pipe, perhaps 25 ft. apart, the pipe being spaced about every 3 ft. Between these vertical pipe standards the bars are piled. The number of bars that can be stored together can be doubled by removing one piece of pipe. All sizes of square twisted bars in lengths from 36 to 45 ft. and of round bars in 36 ft. lengths will be carried in stock, a total storage capacity for 10,000 tons being provided.

The new storage space is also arranged for the installation of the necessary equipment for the cutting, bending and special forming of the bars and for threading machines for making tie rods and other similar material. A blacksmith shop, equipped for all of the required work of that character, immediately adjoins the bar storage bay.

Other additions to the warehousing facilities of this company include a bay, 75 x 490 ft., paralleling the other bays of the plate and structural warehouse. This new floor space will be used for the handling of plates which, as recently announced in *The Iron Age*, are now being carried in extra long lengths.

A new machine shop adjoining the foundry for casting Glyco metal, has also been equipped for the finishing of the recently perfected skeleton construction bearings. This skeleton is made in bronze or steel and of such form as to reinforce the bearing metal throughout both in the body and in the flanges.

To the materials carried in stock, locomotive boiler tubes have recently been added.

The Apollo Steel Company

Apollo, Pennsylvania, will be back on the iron map when the Apollo Steel Company begins operating its new plant about May 1. This company claims to have the most up-to-date sheet rolling mill in this country, all the equipment being of the heaviest and latest type proved to be a success. The roll train, consisting of six finishing, four roughing and two cold rolls, will be driven by a 1400 hp. induction motor, directly connected to the rolls by what is said to be the largest cut gear wheel in the world, being 19 ft. 6 in. in diameter and 42 in. face.

The builders of the plant state that this is the first sheet rolling mill to have direct-driven rolls from motor drive. The heating furnaces are of the combination type, equipped with American coal stokers. The company will manufacture Apollo brand black and galvanized sheets. Robert Lock, formerly superintendent of the Vandergriff works of the American Sheet & Tin Plate Company, is president and general manager; Charles P. Wolfe, cashier of the Apollo First National Bank, is secretary and treasurer. The sales of the Pittsburgh and Western territory are in charge of C. J. Wolfe, and H. M. Davis, 702 Betz Building, Philadelphia, will have the Eastern territory.

The Standard Roller Bearing Company, Philadelphia, Pa., has opened an office in Indianapolis, Ind., in charge of L. M. Watkin, Jr., the office being located in room 1201 State Life Building. The rapidly increasing demand for the company's annular ball, taper roller, ball thrust and roller thrust bearings; steel, brass and bronze balls, and ball bearing hanger boxes made it necessary to divide the territory formerly covered by the Chicago office.

Views on Nomenclature of Machine Tools

Three Expressions in Favor of Giving Each Metal Working Machine an Explicit Name—"Machine Tool" Defended

The many views already published and others contained in recent letters to *The Iron Age* on the use of the term "machine tool" further emphasize the lack of unanimity. Clarity of meaning is called for, not only to meet the demand for the exactness that should characterize machinery and all that pertains to it, but for important legal purposes as well. If there cannot be agreement as to the application of these much discussed words when used in combination, it may be, as some have suggested, that there should come into more general use a specific name for each of the metal working machines usually called "machine tools," so that we would have, for example, "metal planing machine," "metal drilling machine," etc. It would seem a difficult matter to abolish the term "machine tools" as a generic name, yet, in effect, that is proposed by some. The subject is one in which there seem to be limitless possibilities for argument, as there constantly arise the questions of materials worked, power, portability, use of cutting tools and abrasive materials and the characterization of machines which perform forming and shaping operations, where there is no cutting in the ordinary sense of the word.

Examples of Differing Opinions

That a betterment in nomenclature is highly desirable and can be brought about is admitted by many writers and that the matter should be threshed out by the National Machine Tool Builders' Association is asserted by at least one manufacturer. The only conclusion that seems generally accepted is that nearly everyone in the so-called machine tool business has a fair idea of what the words "machine tool" mean, but that the difficulty is in conveying this information to those outside the trade. Some of the divergencies of opinion may be gathered from the following excerpts from letters and decisions.

"Lathe" is a good and explicit designation which has brevity, clearness and wide acceptance.

"Lathe" is a misnomer and "metal turning machine," "turning machine" or "lathe for turning metal" are preferable.

The words "turning machine" might refer to a merry-go-round.

Machine tools cover all metal working machines which are used or can be used regularly for cutting cast-iron.

The term was arbitrarily adopted by metal working machinists.

There is more to the question than arbitrary choice; "lathe," for instance, has a historical significance.

Each machine for working metal should have a specific name, as "metal planing machine," etc.

The term "machine tool" properly means a tool used by a machine.

"Machine tool" does not mean the cutting tool of a lathe or any machine.

The source of character of the power makes no difference in determining the definition, inasmuch as the machine is designed to transform energy.

The term "machine tool" always connotes application of power other than hand or foot power.

L. H. Colburn, general manager of the Colburn Machine Tool Company, Franklin, Pa., conceived the idea which has been published in an article by him confining the term "machine tool" to all metal working machines of that class which are used or can be used regularly for cutting cast iron. When this proposal is analyzed, Mr. Colburn points out in a letter to *The Iron Age*, the definition is one which can at least be easily understood by those not skilled in the handling and use of machine tools, "such as customs officials, etc." Various authorities have voiced objections to Mr. Colburn's proposition, saying that the same machine used for cast-iron might be used for wood. Another manufacturer declares that that is not the point and says: "If a machine primarily is intended or can be used regularly for cutting cast iron, no matter whether wood or rubber were cut in the machine at times, the fact remains that it is a machine organism primarily essential for

the working of this material, viz., cast iron, and was designed with that end in view."

Conflict of Official Rulings

An interesting phase of the question is that in two cases where the United States Board of General Appraisers at New York ruled that bench lathes operated by treadle came within the category of "machine tools" this classification was overruled by the United States Court of Customs Appeals, as reported in these columns. In one case the higher court reiterated former decisions that the term "machine tool" always connotes the application of some kind of power to an implement or tool for its use and operation other than hand power alone and that the term "hand power" includes foot power, and both fall within the same rule, in case the action of the operator alone furnishes the motive power for the machine. In a similar case the Customs Court of Appeals ruled that "foot power applied to a machine places it in the same category for the purposes of the customs as if it were driven by electricity, steam or water," and that the lathes in question were correctly assessed by the collector of customs at 45 per cent. as manufactures of metal.

New Terminology Incidentally Suggested

Charles E. Hildreth, Whitcomb-Blaisdell Machine Tool Company, Worcester, Mass., who has given a great deal of thought to the subject, gives his views in the following interesting answer to a request from this office:

"In order to clear the decks for action, as a naval officer would say, we must first logically dispose of the much mooted question, 'What constitutes a machine tool?' It is perfectly simple and easily done, if the powers that be would only break the bars of usage and follow facts.

"In good plain English, 'machine tool' is a term in contradistinction to 'hand tool' and should mean the tool that is used in the machine and not in the hand. Now, then, what is the name of these important articles which for years have passed under the name of 'machine tools'? Concretely and logically they are machines; but to be explicit, machines must be subdivided, and can be very easily, as power transmission machines, such as stationary and traction engines, etc.; recording machines, such as scales, watches, clocks, etc., and tool machines, which do actual work by means of the power transmitted to them, augmented by the leverage within them, driving the tools used by them. To be clear, then, 'tool machines' must be subdivided into metal-working, wood-working, stone-working, textile, harvesting, dredging, etc. In fact, all machines come logically under this head that do work by means of a tool of any description.

"Our classification, then, would be metal working machines, and to be just we must include in it every form of machine that cuts or forms metal by means of a tool. If we really feel that we are contaminated by such a heterogeneous company, that we ought to be exclusive, in order that we may be favored now and then with special legislation, as, for instance, a seat of honor on the free list, why let us designate our product 'metal-working machines de luxe.' If, however, that distinction creates too lively indigestion, let's be satisfied with where we belong, without any grand title and see if we cannot make just as much money and avoid unpleasant notoriety by manufacturing and selling plain grinding machines, drilling machines, planing machines, turning machines, shaping machines, hobbing machines and all other machines which can bear the name of the operation for which they are designed."

Names Which Specify Metal Working

E. M. Woodward, president and treasurer, Woodward & Powell Planer Company, Worcester, Mass., gives his conclusions as follows:

"For many years the name 'machine tool' has been applied to certain machines for working metal. We believe

that each machine for working metal should have a specific name. For instance:

Metal planing machines.
Shapers for planing metal.
Lathes for turning metal.
Automatic lathes for turning metal.
Vertical boring and turning mills for working metal.
Horizontal boring mills for boring metal.
Metal milling machines.
Metal drilling machines.
Metal gear cutting machines.
Metal gear hobbing machines.

"We question whether punches, shears, drop hammers, helve hammers, steam hammers would be classed as 'machine tools.'

"This is a subject that certainly will require considerable study in order to place the so-called machine tools in a proper list, with the proper name for each machine."

Declares "Machine Tool" a Misnomer

D. M. Wright, Henry & Wright Mfg. Company, Hartford, Conn., is for a complete redesignation. His letter follows:

"Considerable effort and time has been spent in the endeavor to improve the nomenclature of the machinery business the idea being to establish the general acceptance of the most correct names and the choice, as far as possible, of words of single meaning.

"The term 'machine tool' properly means a tool used by a machine, and there appears to be no other reason for its use to describe a machine than its arbitrary adoption by a group of metal working machinists. In its use in the arbitrarily adopted sense, it has no well defined limitations, and therefore has caused more discussion, expense and misunderstanding than possibly any other term in the English language.

"Almost all the machines listed under this misnomer are used for metal working and they could be more correctly and clearly described as metal working machines, and thereby establish a name that has well-defined limits and about which there could be no misunderstanding as to what was meant by the name either among English-speaking people or foreigners or in the courts or custom houses.

"A machine is a mechanism for automatically transforming energy into the various directions and divisions necessary to fill the purpose of its design. A tool is an implement to work with whether by a machine or a man. If the term 'machine tool' be used to describe a machine, it must of necessity include any machine that employs a tool in its work. Inasmuch as a machine is designed to transform energy, the use of the word power before it is superfluous and it can make no difference what the source or character of the power is in determining its definition.

"The use of the words lathe, planer, miller, drill, etc., as names of machines should be avoided as they cause almost as much trouble as the general misnomer, machine tools. A much better way would be to call all machines, machines, differentiating them by some prefix that would clearly describe the reason for their existence, such as turning machine, planing machine, milling machine, etc., and followed out to its logical ending, this would lead to the abandonment of such words as drills, reamers, cutters, taps, etc., and they would be replaced by drilling, reaming, milling and tapping tools.

"The more advanced foreign nations have already gone a long way in this direction, this condition no doubt having been brought about by their being in closer proximity to other foreign nations and having the trouble we are experiencing assume an acute stage at an earlier period.

"The mechanical engineering profession has always prided itself in its extreme measurement of its mechanical operations and it therefore seems highly inconsistent to find it measuring its descriptive language by feet.

"The indexes, editorials and in a large measure the advertisements and catalogues of today show a great increase in the use of more correct nomenclature as compared with three or four years ago, and the great expense the industry has suffered in its contentions at Washington last year and this, and which was very largely caused by the use of impossible nomenclature, should be a powerful incentive to further effort and it may be of passing interest to know that a large number of educational institutions are giving valuable aid at present, so that the spoken language is undergoing an appreciable change.

"There is no such thing as absolute perfection within the grasp of man, but the recognition of this fact and the further fact that the mechanical nomenclature may be very easily and greatly improved at practically no expense and resulting in tremendous profit should be sufficient inducement for anyone interested in mechanical engineering to do what he may to accomplish betterment."

Approves and Would Perpetuate the Term

R. I. Clegg, Cleveland, Ohio, who advanced several suggestions as to the scope and limitations of the term "machine tools" in *The Iron Age* of March 13, contributes further to the discussion as follows:

"'Lathe' is explicit. 'Turning machine' is not inapplicable to a 'merry-go-round.' A grindstone and stand make a 'grinding machine,' but who would call the combination a machine tool? 'Lathe' probably refers more in its original significance to the power behind the tool than to anything else, doubtless being derived from the action of the lathe or flat spring or strip of wood at one end secured to the ceiling and at the other attached to a cord which, applied to the foot lever or treadle or even to the work spindle, was used to return the power lever to its first place after every pressure of the foot in rotating the work. So close has that word 'lathe' stuck to the purposes that I think it will take more to bring about a change than the potency of later authorities. 'Lathe' has all the good qualities of brevity, clearness and of acceptance everywhere that English is used.

"There is more to this question than an arbitrary choice. Machine tool manufacturers have by long and emphatic advertising built up a use of the term that has a definite significance in elegance of applying engineering forces, craftsmanship in the disposition of the structure, convenience of the machine combination of elements, and in the economy and efficiency of power and intelligence input proportionate to the production output. Rightly they should be jealous of any misuse of the term.

"Established words are always best, but there is ever the chance for an entrance through some acute angle of the situation—a crack in an ill-fitting door or window—for a new interpretation, a sort of higher, and sometimes a soggy higher, criticism. To prevent misunderstanding it is therefore a good thing to go over the old landmarks and find out the essentials. And in the case of machine tools it is very desirable that we do not throw aside the complimentary associations of this long-established name. It has through these many years earned a respectable standing and a technical worth that make its use primarily a badge of honor. To say of any mechanical contrivance that it is a machine tool is certainly 'honorable mention,' and to all mechanics that use of the term is so universally accepted that in whatever definition may ever be agreed upon the machine tool builders will lose much if that meaning is not enforced and perpetuated."

Electric Steel Plant at Lebanon, Pa.

After four years of investigation, the American Iron & Steel Mfg. Company has decided to build an electric steel plant at Lebanon, Pa., work on which is to be started at once. This was decided upon March 15 at a meeting of the board of directors. About \$500,000 will be required for the building and equipment.

The company is a large manufacturer of bar iron, bolts, nuts, washers, lag screws, turnbuckles, boiler and structural rivets, cap and set screws, railroad spikes, track bolts, car forgings, etc., with a capacity in its various departments of about 150,000 tons a year. Some of these products are made of steel as well as iron, but heretofore the company has had no steel plant and has been obliged to buy steel billets which has occasioned vexatious delays in delivery with incidental inconveniences. The type of electric furnace to be used has not been made public, but it is expected to install two of 20 to 25 tons capacity, forming the largest electric steel plant in the country, capable of producing annually 70,000 to 80,000 tons of steel. Standard blooming and billet mills and other rolling mill equipment will be built to round out this department, which will be operated electrically. The company expects to turn into finished products all the steel it will make. A local paper states that the electrification of the entire present plant is also a part of the plan of improvement agreed upon.

Melting Processes of the Steel Foundry

The Different Methods of Production and the Chemical, Physical and Metallographic Characteristics of Castings

BY EDWIN F. CONE

The production of steel castings has grown to such extensive proportions in this country in the past 10 to 20 years that the ordinary layman or even consumer little appreciates the extent of the expansion. Due to varying methods of production the term "steel casting" means a number of different things regarded from the point of view of strength, composition, etc. The various kinds of such castings now on the market in this country are embraced under the following heads:

- 1.—Acid Bessemer steel castings,
- 2.—Basic open-hearth steel castings,
- 3.—Acid open-hearth steel castings,
- 4.—Crucible steel castings,
- 5.—Electric furnace steel castings.

and their method of manufacture and properties in general are treated here under the above designations.

Bessemer Converter Steel Castings

Very few castings are made in this country from steel made in a Bessemer converter of the ordinary bottom-blown type except possibly some which a manufacturer having such a converter would make for his own use. They can be either acid or basic. No basic Bessemer castings are produced in this country, though in Europe, especially on the continent, the basic-lined Bessemer converter is employed. An instance was referred to in *The Iron Age* of March

28, 1912, in an article dealing with the steel in the sternpost of the North German Lloyd steamship *Princess Irene*—a casting which broke in service. An analysis of this steel gave results about as follows:

Analysis of a Steamship Sternpost

Carbon	0.35 to 0.45 per cent.
Manganese	0.70 to 0.90 per cent.
Silicon	0.25 to 0.35 per cent.
Sulphur	0.060 per cent. and upward
Phosphorus	0.060 per cent. and upward

Steel of this character is usually high in occluded gases, such as nitrogen and oxygen, and contains more slag, oxides and manganese sulphide impurities than any other steel usually entering into castings. Hence the weakness and inferiority of such castings. It has been stated to the writer by a German engineer of reliability and experience that there are frequent failures in service of marine steel castings made in continental Europe and that they have to be frequently replaced, usually by forgings.

The physical properties of basic Bessemer castings are not high. The ductility is low in proportion to the tensile strength and there is a greater tendency to brittleness than with other kinds of steel castings.

Photomicrograph Fig. 1 shows the oxidized condition of the metal. It is taken from an unetched piece of steel from the original sternpost of the *Princess*

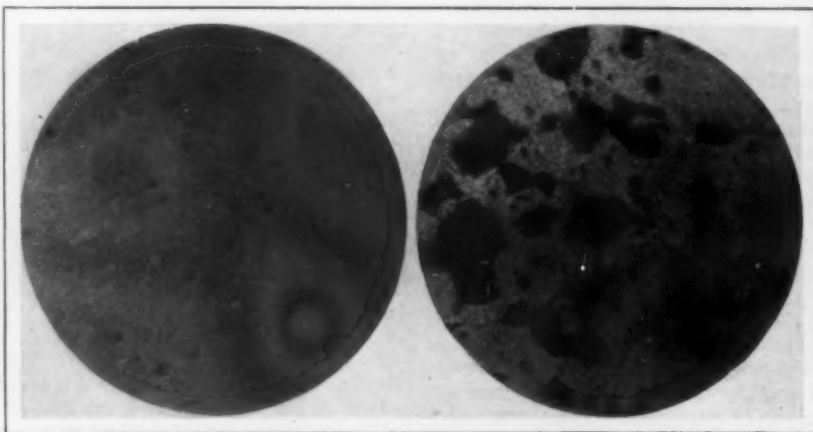


Fig. 1

Fig. 2

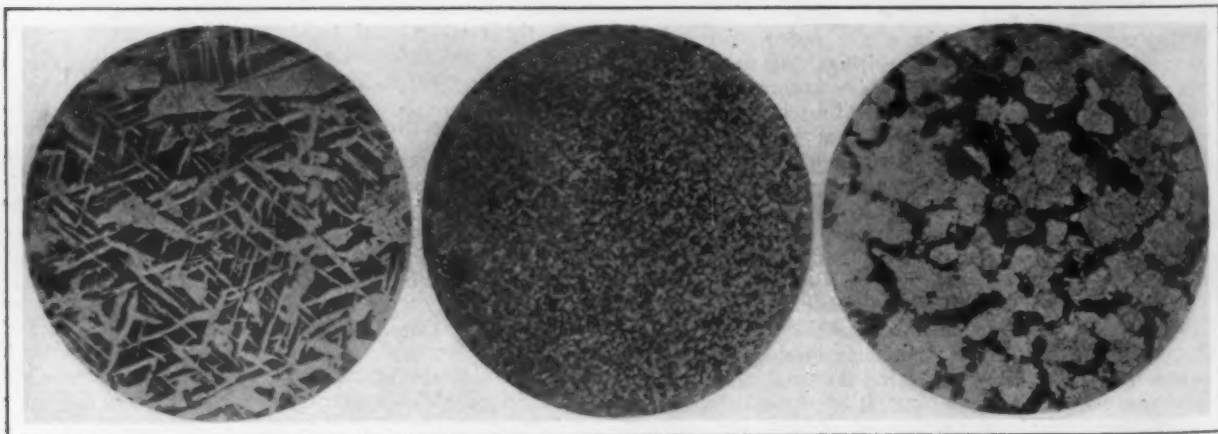


Fig. 3

Fig. 4

Fig. 5

PHOTOMICROGRAPHS OF BASIC STEEL CASTINGS, REPRODUCED ABOUT TWO-THIRDS SIZE OF ORIGINALS AT 87 DIAMETERS.

Process	Fig. 1 Bessemer	Fig. 2 Bessemer	Fig. 3 Open Hearth	Fig. 4 Open Hearth	Fig. 5 Open Hearth
Etched in nitric acid	No	Yes	Yes	Yes	Yes
Annealed	Yes	Yes	No	Yes	Yes
Carbon, per cent.	0.35	0.35	0.28	0.25	0.25
Manganese, per cent.	0.70	0.70	0.75	0.67	0.67
Silicon, per cent.	0.277	0.277	0.319	0.315	0.315
Sulphur, per cent.	0.060	0.060	0.032	0.033	0.033
Phosphorus, per cent.	0.062	0.062	0.016	0.013	0.013
Tensile strength, lb. per sq. in.	71,500	71,500	71,500	75,500	65,000
Elastic limit, lb. sq. in.	29,000	29,000	38,000	49,000	34,000
Elongation in 2 in., per cent.	23.5	23.5	30.0	31.0	29.0
Reduction of area, per cent.	36.0	36.0	44.9	48.3	43.4
Fracture	Irregular	Irregular	Irregular	½ cup	Irregular

Irene. Steel thus oxidized cannot help but be weak. This same steel in the annealed condition, as annealed in Europe, is shown in Fig. 2, and even here the oxidized portions are clearly discernible.

"BABY" CONVERTER STEEL CASTINGS

In this class are all those castings made in any style of small or "baby" converter of whatever name, and there are several varieties patented. The process consists in melting iron and scrap in a cupola, as in an iron foundry, and blowing the resulting product in a small side-blow converter where it is converted into a low carbon iron of a high temperature, and then by the addition of proper amounts of silicon and manganese a steel is produced of usually the average composition here given. The composition will depend upon the practice of the particular foundry.

Composition of Tropenas or Converter Steel Castings

Carbon	0.12 to 0.20	per cent
Manganese	0.60 to 0.85	per cent
Silicon	0.30 to 0.40	per cent
Sulphur	0.030 to 0.080	per cent
Phosphorus	0.030 to 0.060	per cent

The objections offered to such steel castings are usually that the metal is oxidized because of the process employed and also that the sulphur content is injuriously high. It is true that the metal is liable to be oxidized, the same as shown in the case of the large Bessemer converter, but usually not to such an extent as to be harmful. It is also true that the sulphur content is usually above 0.060 per cent, and rarely as low as 0.030 per cent. It is a debatable question among metallurgical foundrymen whether high sulphur is really harmful to steel castings. Because sulphur causes red-shortness, any possible harm to the castings has been accomplished before the casting has cooled, i. e., cracks have developed and are discernible in the cold castings, or if not discernible then, they appear after annealing because of expansion. It is likely that the harm from high sulphur in converter castings is exaggerated. But the sulphur content can be kept down by judicious use of scrap and low sulphur coke.

The physical properties of this grade of steel castings can best be illustrated by some actual tests made on the product of one of the con-

verter foundries and given in the accompanying table:

Physical Properties of Tropenas or Converter Steel Castings

Tensile strength, lb.	Elastic limit, lb.	Elongation in 2 in. per cent	Reduction in area per cent	Character of fracture
1 68,000	39,000	34	59.9	1/2 cup
2 67,500	36,000	30.5	61.1	1/2 cup
3 67,500	36,500	34	59.9	1/2 cup
4 69,500	36,000	33	57.3	1/2 cup
5 69,000	36,000	35	58.6	1/2 cup
6 67,000	35,000	30.5	53.3	1/2 cup
7 87,500	45,000	17	30.9	Irregular

Chemical composition of steel No. 1 was as follows: C., 0.11; Mn., 0.67; Si., 0.338; S., 0.052; P., 0.040.
Steel No. 4: C., 0.13; Mn., 0.61; Si., 0.315; S., 0.063; P., 0.044.
Steel No. 6: C., 0.13; Mn., 0.63; Si., 0.282; S., 0.080; P., 0.053.
Steel No. 7: C., 0.25; Mn., 1.12; Si., 0.138; S., 0.069; P., 0.046.

The condition of this steel under the microscope is shown in Figs. 8 and 9, which represent tests Nos. 6 and 7. These show excellent annealing and of especial interest is Fig. 8 which shows the effect of the high manganese content.

Basic Open Hearth Steel Castings

There are probably more castings of this designation made in the United States than by any other process, with the acid open hearth a close second, i. e., judged from a tonnage standpoint. The majority of basic open hearth castings are those generally designated as car castings, i. e., bolsters, draw-bars, knuckles, etc. In fact, foundries making basic steel generally pour nothing else. Their output is on a large scale. Such castings are almost invariably poured in green sand, i. e., a skin-dried mold, not a mold thoroughly baked in an oven to remove all moisture.

The chemical composition is about as here given. These limits are not arbitrary, for in many cases the composition is outside, but the figures represent the general average. The objection to this kind of steel is that it is more or less "wild" while being poured, i. e., it is necessary to have a high initial-pouring silicon content—0.35 to 0.40 per cent.—which in itself is more or less objectionable; with a consequent low phosphorus content. But while the steel is in the ladle there is a reaction taking place between the silicon in the steel and the phosphorus in the slag, the steel gaining in phosphorus and losing in silicon content. The natural result is a tendency to porosity, for the



Fig. 6—Acid Open Hearth

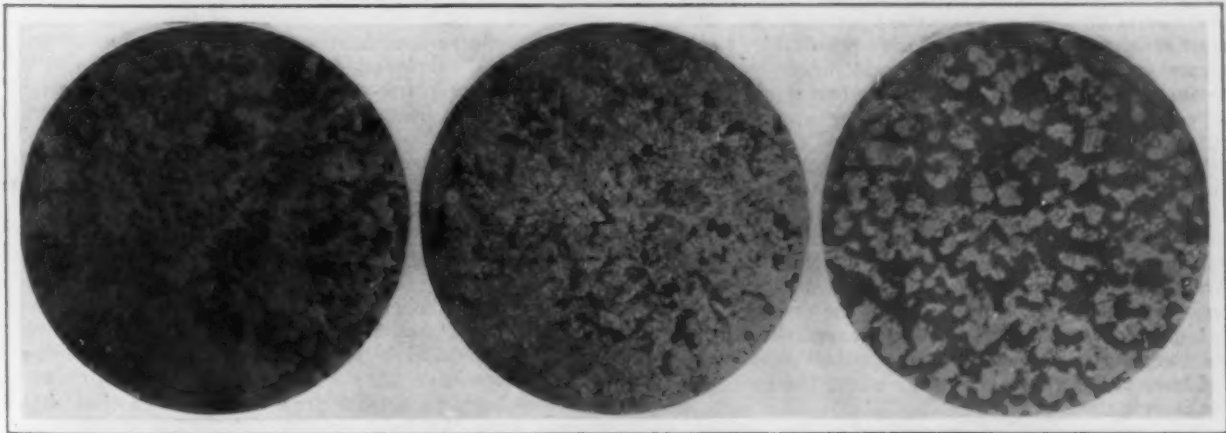


Fig. 7—Baby Open Hearth

Fig. 8—Baby Converter

Fig. 9—Baby Converter

PHOTOMICROGRAPHS OF STEEL CASTINGS REPRODUCED ABOUT TWO-THIRDS OF ORIGINALS AT 87 DIAMETERS

	Fig. 6. Acid open hearth. Picric acid.	Fig. 7. Baby open hearth. Nitric acid.	Fig. 8. Baby converter. Nitric acid	Fig. 9. Baby converter. Nitric acid.
Processes	No	Yes	Yes	Yes
Etching medium	No	Yes	Yes	Yes
Annealed	No	Yes	Yes	Yes
Carbon, per cent.	0.29	0.16	0.13	0.25
Manganese, per cent.	0.67	0.43	0.63	1.12
Silicon, per cent.	0.301	0.394	0.282	0.138
Sulphur, per cent.	0.041	0.062	0.080	0.069
Phosphorus, per cent.	0.036	0.036	0.055	0.046
Tensile strength, lb. per sq. in.	70,000	59,000	67,000	87,500
Elastic limit, lb. per sq. in.	36,000	31,500	35,000	45,000
Elongation in 2 in., per cent.	22.0	35.5	30.5	17.0
Reduction of area, per cent.	30.9	65.9	53.3	20.6
Fracture	1/2 cup	cup	1/2 cup	1/2 granular

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lower the silicon content of steel castings the more the tendency to porosity.

Analysis of Basic Open Hearth Steel Castings

Carbon	0.20 to 0.30	per cent
Manganese	0.65 to 0.80	per cent
Silicon	0.400 to 0.200	per cent
Sulphur	Under 0.30	per cent
Phosphorus	0.015 to 0.040	per cent

It is thus seen that when a mold is filled with a metal of this character it contains a steel in a more or less unfinished condition, i. e., not in the quiescent state. Such metal, when machined, is likely to show blow-holes. Hence it is the general practice of steel foundries to pour basic metal only into such castings as are not to be machined except in one or two places, but to be used as poured. There are one or two foundries, however, where castings to be machined are poured in basic steel, and successfully so. Whether their losses in defective castings are larger in proportion than in the acid open hearth is not demonstrable, but it is probable.

The physical properties of basic open hearth steel castings depend upon the method of annealing or heat treatment. As a general rule, other things being equal, higher strength and ductility are obtainable from basic than from acid open hearth steel castings. The average physical properties of the basic castings are usually within the limits here given:

Physical Properties of Basic Open Hearth Steel Castings

Tensile strength	60,000 to 85,000 lb. sq. in.
Elastic limit	32,000 to 43,000 lb. sq. in.
Elongation	25 to 35 per cent in 2 in.
Reduction of area	50 to 55 per cent

The general microstructure of basic open hearth steel castings in the green (natural) and annealed condition is revealed in Figs. 3, 4 and 5. Fig. 3 shows the natural condition of an un-annealed casting as cast in green sand. Fig. 4 shows the condition of the steel after quick cooling in the air from above the recalescence point, and Fig. 5 shows the condition of the same piece after slow cooling in a closed annealer at the same temperature. The variation in the physical results is striking, as between the two methods of annealing on the same piece of steel.

Acid Open Hearth Steel Castings

Foundries which produce acid open hearth castings are those which make what is usually known as jobbing work, i. e., castings that are to be machined, in whole or in part, before using, and castings to supplant forgings. The main output of such foundries consists in locomotive castings of all kinds, such as frames, wheel centers, etc., in marine castings of every description, such as stern posts, rudders, etc., in machine tool castings and others of like character. It is a general principle of foundry practice that it is feasible and practicable to incorporate in such castings only acid open hearth steel, because of the tendency of the other metal—basic—to be porous and uncertain. As before stated, there are exceptions to this and it is even claimed that it is or will soon be possible to make as sound and solid castings from the basic as from the acid open hearth. Attempts to accomplish this by displacing the basic slag on the top of the ladle with an acid slag have been made, but only with partial success, especially from a financial point of view. The producing of large marine, machine tool and locomotive castings in acid open hearth steel—some castings weighing as high as 100,000 lb. each—is now accomplished easily, and the complete machining of such castings reveals a solid and homogeneous metal, but only where the foundry practice is first class.

The average chemical composition of the ordinary carbon steel castings of this class is here given. Unless the casting is very large there is no segregation, and there is a surprising uniformity of chemical composition of castings from various parts of the heat. This cannot by any means be said of basic open hearth castings.

Analysis of Ordinary Acid Open Hearth Steel Castings

Carbon	0.20 to 0.30	per cent
Manganese	0.60 to 0.70	per cent
Silicon	0.25 to 0.30	per cent
Sulphur	Under 0.040	per cent
Phosphorus	Under 0.035	per cent

The physical properties of the average acid open hearth casting of the range in composition noted depend, of course, on the annealing or heat treatment, and also on the

general microstructure of the initial steel before treatment. This subject is worthy of a discussion by itself. However, the accompanying table gives the general static properties of the steel:

Tensile strength	65,000 to 75,000 lb. per sq. in.
Elastic limit	50 to 52 per cent of the tensile strength
Elongation in 2 in.	22 to 35 per cent
Reduction of area	30 to 50 per cent

There is quite a demand also for acid open hearth castings of 0.40 per cent. carbon content, and the experimental demand is growing. Some railroads are using locomotive frames of this composition, even against the advice of some foundrymen, and the Navy is using a 0.40 carbon metal in the sternposts and stem castings of the large battleships, whereas formerly the ordinary carbon or mild steel was satisfactory. There is a considerable increase in tensile strength arising from the use of this grade of metal, but there is, on the other hand, the greater tendency to brittleness and consequent breaking after constant vibration. The wisdom of using such high carbon metal in such castings can be substantiated only after the test of time. The physical characteristics and average chemical composition of this 0.40 carbon metal, when properly made and annealed, are here tabulated and the results are achieved regularly in the best foundries.

Physical Property and Chemical Composition of 0.40 Carbon Steel Castings

Tensile strength	80,000 to 90,000 lb. per sq. in.
Elastic limit	50 to 52 per cent of tensile strength
Elongation in 2 in.	15 to 20 per cent
Reduction of area	20 to 30 per cent

Carbon	0.38 to 0.42	per cent
Manganese	0.65 to 0.75	per cent
Silicon	0.25 to 0.30	per cent
Sulphur	Under 0.045	per cent
Phosphorus	Under 0.035	per cent

To illustrate the microstructure of the acid open hearth steel in the green condition, Fig. 6 is shown. The relatively larger crystals are due largely to the slow cooling in the sand. In the annealed condition the microstructure of this steel does not differ much from that of the basic, as shown in Figs. 4 and 5.

Baby Open Hearth Steel Castings

Yearly the production of steel castings by this method is assuming greater proportions and importance. The field covered is that of the small and intricate castings—such as are not possible to pour economically from a large ladle, and such as require a high temperature metal to flow through thin and often intricate sections which the colder metal of the large open hearth cannot successfully do. These furnaces are either basic or acid, depending on the desire of the producer and the castings to be produced. It should be possible to make a metal of the same composition as the large open hearth and an examination of various products has revealed a composition very similar to any other open hearth steel, with like physical properties, other conditions being equal. The main objection offered to castings of this grade is that the metal is more highly oxidized than that of the large open hearth because made in such smaller quantities—2 to 4 tons to a heat—and thus more exposed to the action of the flame and gases of the furnaces. This is true in some cases and in some cases not true, depending largely on the kind of furnace and the manipulation.

This is not the place to discuss the relative economy of the two processes, large and small open hearth, though it is proper to remark that it is manifest that the small is the more expensive. At the same time, the class of castings produced brings a greater price in proportion than those poured from the large open hearth. One strong point, however, in favor of the small furnace is as follows: In the large foundries very small castings are necessarily poured from a ladle with a 2 or 2½-in. nozzle, whereas in the small open hearth foundry they are poured from a ladle with 1 or 1½-in. nozzle. Manifestly there is much more waste in the former than in the latter case where three castings can often be poured with the same quantity of metal that it would require to pour two castings in the former.

The automobile trade is supplied to a considerable extent with castings made by this process, and one or two foundries in this country pour projectiles for our Navy from small basic or acid open hearth furnaces, and usually of a high carbon content with chromium.

The physical and metallographic properties of castings differ very little from those of any other kind of open hearth. From the writer's practical experience, the following may be cited as interesting results from the baby open hearth furnace:

Physical Properties of Baby Open Hearth Steel Castings				
	Tensile strength	Elastic limit	Elongation in 2 in. per cent	Reduction in area per cent
1*	59,000	31,500	35.5	65.9
2	65,000	37,000	31	46.3
3	74,000	34,500	23.5	29.2
4*	74,000	37,000	22	30.9
5	62,000	35,000	32	44.9
6	69,500	40,000	30	44.4
				Character of fracture cup
				Irregular
				Irregular
				Irregular
				1/4 cup

*Chemical composition of steel No. 1 as follows: C., 0.16; Mn., 0.43; Si., 0.394; S., 0.062; P., 0.036. Chemical composition of steel No. 4: C., 0.35; Mn., 0.48; Si., 0.490; S., 0.040; P., 0.030.

To illustrate this steel microscopically the first of the above physical tests is shown in Fig. 7.

Alloy Steel Castings

The subject of alloy steel castings can be appropriately touched upon here, since the majority of them are produced in open hearth foundries. The principal alloy steel castings on the market to-day and in most demand are:

- 1.—Vanadium steel castings.
- 2.—Nickel steel castings.
- 3.—Titanium steel castings.

VANADIUM CASTINGS

Vanadium steel castings are increasing very fast in general use, especially in locomotive castings. Many

TITANIUM CASTINGS

The use of titanium in steel castings has not been carried so far as that of other alloys and hence the information regarding its effect in particular is not wholly conclusive. If properly applied and allowed to do its work effectively on the metal, it is supposed to clean the steel of all gases, oxides, slags or other impurities, and, of course, in that event to produce a very fine casting. Very much more practical information regarding actual results is desirable on this subject.

Crucible Steel Castings

The class of castings usually poured in this metal comprises the same kind as made by the converter and small open hearth producers and one competes with the other. The steel is necessarily very hot and fluid and should be very pure as regards oxides, slags, etc., because melted in crucibles out of contact with the air. It is only within the last five years that this department of the steel foundry business has assumed decided market proportions. It is possible to turn out a clean-cut, sharp casting and it is found that certain patterns can be poured successfully only in this metal.

Chemically this metal is hard to regulate. It is melted usually in either clay or plumbago pots. If made in the former, the metal takes up some silicon and the resulting product is usually high in this element. If melted in the latter carbon is absorbed and metal of a low carbon content is difficult to produce. Most producers in this country use the clay crucible. Sulphur and phosphorus are determined by the quality of scrap melted. In general,



Fig. 10—Crucible Steel Casting Fig. 11—Electric Furnace Steel Casting Fig. 12—Electric Furnace Steel Casting

Fig. 10—Photomicrograph, reduced about two-thirds from original at 87 diameters; specimen annealed and etched in picric acid; chemical composition, carbon, 0.22; manganese, 0.71; silicon, 0.565; sulphur, 0.050; phosphorus, 0.022; physical characteristics, tensile strength, 70,000 lb. per sq. in.; elastic limit, 36,000 lb. per sq. in.; elongation, 31 per cent. in 2 in.; reduction of area, 52 per cent.; fracture, 1/4 cup. Fig. 11 and Fig. 12 are reproductions of photomicrographs of electric furnace steel castings. Fig. 11, unannealed and Fig. 12 annealed, both etched in nitric acid.

engine frames are now made of this metal and numerous other parts of the locomotive subject to shock from use. So far as reports are obtainable, such castings are bearing up well and proving the worth of the presence of vanadium. The small percentage of vanadium in the steel, 0.16 to 0.20 per cent., produces the following physical effects after annealing:

- Raises the tensile strength 10 to 15 per cent.
- Raises the elastic limit to 60 to 62 per cent of the tensile strength.
- Increases ductility in proportion.
- Increases dynamic strength.

NICKEL CASTINGS

The demand for these alloy castings is not so great as their worth warrants. The incorporation of 3 to 3 1/2 per cent. of nickel in ordinary carbon steel for casting produces a metal, after careful annealing or heat treatment, of the average properties here tabulated:

Physical Properties and Chemical Analysis of Nickel Steel Castings	
Tensile strength	80,000 to 100,000 lb. per sq. in.
Elastic limit	60 to 65 per cent of the tensile strength
Elongation in 2 in.	15 to 25 per cent
Reduction of area	25 to 35 per cent
Carbon	0.25 to 0.35 per cent
Manganese	0.60 to 0.70 per cent
Silicon	0.25 to 0.30 per cent
Nickel	3.00 to 3.50 per cent

crucible steel castings will have an average chemical composition as here given:

Chemical Composition of Crucible Steel Castings

Carbon	0.20 to 0.50 per cent
Manganese	0.40 to 0.70 per cent
Silicon	0.25 to 0.50 per cent
Sulphur	} As stock runs
Phosphorus	

Their physical properties depend on the heat treatment and do not differ materially from other steel castings. The accompanying table of typical results from

Physical Properties with Chemical Composition of Crucible Steel Castings

Tensile strength, lb. per sq. in.	70,000	67,000
Elastic limit, lb. per sq. in.	36,000	34,500
Elongation in 2 in., per cent.	31	30
Reduction in area, per cent.	52	53.6
Character of fracture	1/4 cup	1/4 cup
Carbon, per cent.	0.22	0.24
Manganese, per cent.	0.71	0.70
Silicon, per cent.	0.565	0.587
Sulphur, per cent.	0.050	0.066
Phosphorus, per cent.	0.022	0.022

such steel, out of the writer's practical experience, may be cited. Strength and ductility are excellent. Note, however, the high silicon content of this grade of steel castings, made in clay crucibles. The microscopical appearance of the steel is revealed in Fig. 10.

Electric Furnace Steel Castings

The practical application of the electric furnace in making steel has not been carried so far in producing steel castings as in other lines, such as tool steels and special steels, as a substitute for the higher grades of crucible steel. But its popularity is growing and there are a number of foundries using one type or another of electric furnace to produce only steel castings. This phase of the business has reached much larger proportions in Europe and some very fine castings are made there in steel that have not been equalled in this country.

The principal claims of the producers of this grade of castings are as follows:

- 1.—Extreme purity of metal.
- 2.—Extreme fluidity.
- 3.—Extreme uniformity.

Because of the fact that the source of heat is a non-oxidizing medium and because also the metal is melted largely away from contact with the air, the above claims are substantiated. Also, it is possible to eliminate sulphur as well as other elements to a greater extent in this process than in any other. Of course, the high temperature makes possible the pouring of very thin and intricate sections. The purer the metal, the more perfect the castings. Therefore, these producers claim they can make more perfect castings than can be produced by any other process owing to the fact that their metal contains less gases, oxides, slags, manganese sulphide and sulphur in particular. It is possible to produce a metal in an electric furnace lower in sulphur and phosphorus than in any other—particularly sulphur. The high temperatures make possible chemical reactions to eliminate sulphur impossible to attain in any other steel furnace. The production of alloy steel castings is made simpler in this furnace, it is claimed.

The writer has had very little success in securing electric furnace steel for examination. The pieces he did obtain showed a chemical composition here tabulated, which reveals a remarkably pure steel and lower in sulphur and phosphorus than castings by any other process.

Chemical Composition of Electric Furnace Steel Castings

Carbon	0.135 per cent
Manganese	0.575 per cent
Silicon	0.366 per cent
Sulphur	Under 0.020 per cent
Phosphorus	Under 0.015 per cent

Physically the steel, after heating to above the recalescence point and allowing to cool slowly in a closed annealer, gave results about as here given. The striking feature about these tests is the high elastic ratio, or the ratio that the elastic limit bears to the tensile strength, of 61 to 67 per cent., something entirely unusual in ordinary carbon cast steel so annealed or unless especially heat-treated.

Physical Properties of Electric Furnace Steel Castings

Tensile strength, lb. per sq. in.	58,000 to 60,000
Elastic limit, lb. per sq. in.	37,000 to 40,000
Elongation in 2 in., per cent.	32 to 35
Reduction of area, per cent.	60 to 63
Elastic ratio, per cent.	61 to 67

Under the microscope the steel showed a decided absence of slag, oxides, etc. In the green or natural condition the electric cast steel has the appearance shown in Fig. 11, and this same steel annealed by slow cooling is shown in Fig. 12.

Semi-Steel Castings

The importance of these is not great. They are merely cast iron in which has been melted various proportions of steel scrap and the resulting product is a casting of higher tensile strength than the usual run of iron castings. They cannot be classed as steel castings, though in commercial practice care is not always taken to emphasize this fact.

The purchaser of steel castings should have a fairly general knowledge of the various kinds discussed and place his orders in accordance with the uses to which they are to be put. All castings should be annealed and never used in the green condition. It will recompense the user in the end to pay the extra price for a thoroughly annealed product, no matter of what kind or how used. It is plainly evident from a comparison of the photomicrographs, revealing the green and annealed condition of any

steel casting, that the former is the weaker, because of the large crystals and their laminated instead of closely knitted inter-relation. The steel foundry business is growing by leaps and bounds everywhere, and processes and product are improving constantly.

Shenango Furnace Company's Ore Book

The Shenango Furnace Company, Pittsburgh, has sent out its annual booklet giving the 1913 analyses of the Lake Superior iron ores mined by the company. It has three important Mesaba range mines, the Shenango, Webb and Whiteside, and full analyses of the Bessemer ore from each are given; also tables of analyses of non-Bessemer ores from the Wilpen, Webb and Whiteside mines and of Clifford and Antoine silicious ores from the Menominee range. Through its affiliated interest, the Shenango Steamship Company, it operates two ore steamers, the William P. Snyder and the Wilpen, and through the Shenango Steamship & Transportation Company, three ore steamers, the Shenango, James M. Schoonmaker and William P. Snyder, Jr. The Shenango Furnace Company operates three blast furnaces at Sharpsville, Pa., and also has under lease Alice furnace of the Valley Mold & Foundry Company at Sharpsville. It has coke works at Wilpen, Pa. Its products are sold by W. P. Snyder & Co. The general offices are in the Oliver Building, Pittsburgh, with branch offices at Cleveland.

In the ore booklet the following table is given showing the result of the Cambria Steel Company's tests of Shenango (Bessemer) and Wilpen (non-Bessemer) ores, as representative of 500,000 tons of these ores delivered to that company in the years shown:

Test made	Shenango Ore		
	Nov. 30, 1909	Nov. 8, 1911	Sept. 27, 1912
	Per cent.	Per cent.	Per cent.
Held on ¼-in. mesh.....	49.00	49.00	49.00
Held on 40-in. mesh.....	31.00	31.00	37.00
Held on 80-in. mesh.....	65.79	7.50	6.00
Held on 100-in. mesh.....	18.42	2.50	1.00
Through 100-in. mesh.....	15.79	10.00	7.00
	100.00	100.00	100.00

Test made	Wilpen Ore		
	Dec. 12, 1910	Nov. 11, 1911	Oct. 2, 1912
	Per cent.	Per cent.	Per cent.
Held on ¼-in. mesh.....	53.00	53.00	60.00
Held on 40-in. mesh.....	81.98	37.00	31.00
Held on 80-in. mesh.....	9.88	4.50	3.50
Held on 100-in. mesh.....	8.14	5.00	1.50
Through 100-in. mesh.....	8.14	5.00	4.00
	100.00	100.00	100.00

The Western Electric Company's Year

The Western Electric Company reports a total income of \$72,921,339 in the fiscal year ended December 31, 1912, against \$66,549,268 in 1911. The net earnings in 1912 were \$5,710,000, against \$4,135,201 in 1911. Of the income for 1912, \$2,000,000 was reserved for contingencies against a similar reserve of \$800,000 in 1911. The amount of \$285,855 was also reserved for employees' benefits. After dividends of \$1,500,000 were paid in each year, the amount carried to surplus at the close of 1912 was \$1,067,410, against \$980,292 at the close of 1911. The balance sheet shows that the company now has a reserve for pensions of \$1,070,000, a reserve for contingencies of \$3,500,984, and a surplus of \$21,168,764. For seven years the company has maintained a pension system for the benefit of its employees and there are now 57 pensioners on the roll, an increase of eight during the year. The average pension paid was \$634 per annum.

What the crane follower should know of slinging and making hitches is described with numerous illustrations in the General Electric Review for March, published by the General Electric Company, Schenectady, N. Y., by John Riddell, mechanical superintendent of the Schenectady works of the company. The article has a definite relation to safety measures in the industrial establishment.

The Winey Brothers Mfg. Company, Elkhart, Ind., has been incorporated with \$60,000 capital stock, to manufacture building supplies. The directors are August G., Austin B. and Harvey B. Winey.

An Unusual Device for Measuring Gas Flow

A new instrument known as the rotameter, to indicate the amount of a gas or liquid consumed per hour, has been placed on the market by the Hydro Mfg. Company, 722 Lewis Building, Pittsburgh, Pa. The instrument gives its indications in a simple manner and does not measure absolute quantities like the ordinary gas meter but the force of the gas current instead. The operation of the instrument is based upon the lifting of a float inside a vertical glass tube.

The rotameter is intended for measuring, regulating and controlling the quantity or velocity of gases in pipe lines, and in this case they are installed directly in the pipe line. The smallest current, it is emphasized, will lift the float at once and hold it at a height corresponding or proportional to the velocity of the gas in the line. The scale on the outside of the glass tube gives the amount of gas per hour, minute or second directly, and no calculations are required. Among the applications of this device are controlling and checking the measuring devices indicating the gas consumption of and the gas passage through burners, valves, radiators, cutting and welding burners; determining the air consumption of instruments using compressed air, of ventilators, compressors or gas engines and controlling the amount of gas manufactured in gas plants, in blast furnaces and in any other industries, mechanical, chemical and metallurgical.

The gas current that is to be measured flows through a vertical glass tube, the inside diameter of which increases continuously from the bottom to the top, and inside the tube is a conical float, Fig. 1, that rises to a certain height when the gas is flowing through the tube, the lift of the float depending upon the velocity of gas or upon the amount passing through the tube in any given unit of time. The float has a cylindrical rim containing notches, as shown in Fig. 1. The passage of the gas through these notches causes the float to rotate and the rotation keeps it in a vertical position and prevents friction on the wall of the tube. The white spiral line makes the rotation of the float visible and enables the fact whether the meter is working or not to be ascertained readily. The glass tube is graduated on the outside, the calibration being obtained empirically since the inside of the tube cannot be made with an absolutely uniform slope. These graduations can be made to read directly in cubic feet per hour, minute or second or in millimeters as may be desired. If the latter graduations are used, a table for determining the exact amount of gas in cubic feet flowing through the meter is furnished. These instruments are built for volumes ranging from a few cubic inches to many cubic feet, a meter of the latter type being illustrated in Fig. 2.

Several types of the rotameter are made, among these being a regulator which is designed and built

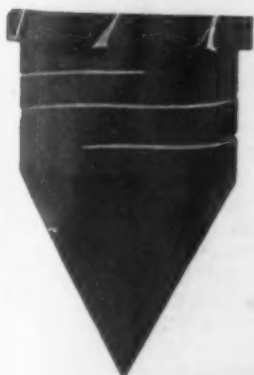


Fig. 1

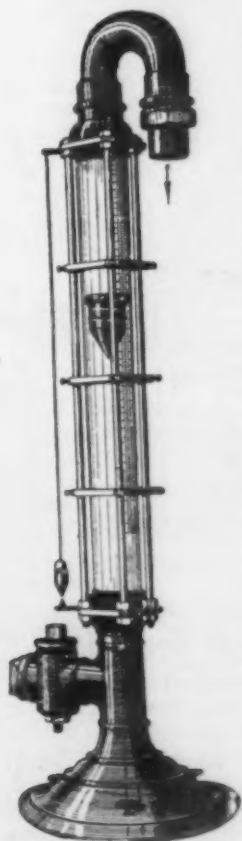


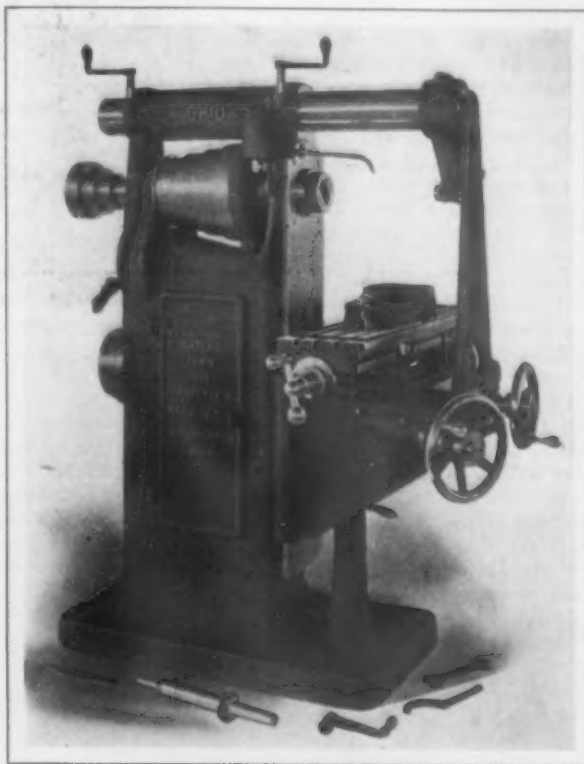
Fig. 2

The Float and a Large Size Rotameter for Measuring Gas Flow

on the same principle but has a scale calibrated in millimeters only. Another instrument is a controller which is calibrated for use with air or water only but can be adapted for liquids and gases by the use of tables giving the necessary constants. There are also a leak detector and a pocket instrument for testing lamps, etc., and the rotameter can also be furnished for measuring the consumption of oxygen and acetylene in welding operations.

A Plain Milling Machine with Improved Drive

The Oesterlein Machine Company, Cincinnati, Ohio, has recently brought out a new type of plain milling machine. The cone pulley on this machine has been im-



A New Type of Plain Milling Machine with an Improved Driving Pulley Construction

proved to get a larger arc of contact for the belt, and the machine has been made the same as the company's No. 20 universal milling machine, with the exception of the saddle. The spindle nose has been made a duplicate of the larger sizes, the No. 24 plain machine, which was illustrated in *The Iron Age*, June 27, 1912, the No. 28 plain, the No. 20 universal and the No. 25 universal machines, the last of which was illustrated in *The Iron Age*, April 7, 1910, so that all tools and cutters are interchangeable.

The back gear is placed inside the column below the spindle, and the arbor is driven with a clutch in front of the spindle. The knee is locked with a taper sliding gib clamping along the entire face of the column and operated by a single lever. Handwheels are provided for cross and vertical adjustment, and the column has oil wells for lubricating the spindle.

"A Little Journey to the Home of the Economy Turbine," written by Elbert Hubbard as the result of a visit to the works of the Kerr Turbine Company, Wellsville, N. Y., includes an interesting discussion of steam economy from the time of James Watt to the present, a breezy sketch of the persons responsible for the company's success and a description of this special type of turbine.

The Lukens Iron & Steel Company, Coatesville, Pa., is building a new 50-ton open-hearth furnace which will make a total of 16 furnaces.

The Bernhardt Open-Hearth Furnace

Results with the More Recent Changes in the Design—Increased Life with Economy in Repairs

In *The Iron Age* of October 12, 1911, an account was given of a new open-hearth furnace construction, designed by F. Bernhardt of Königshütte and known in Germany as the Bernhardt furnace. Since that time important changes have been made in the design and some facts are available regarding the results of practical operations. These are given by the inventor in *Stahl und Eisen* of February 20, 1913.

The design of the furnace with improvements to date is shown in Figs. 1 and 2. The general construction is simplified, the principal features being the complete independence and easy accessibility of all parts. The elevation shown in Fig. 1 is that of a 50-ton furnace. The furnace proper is built independent of the lower parts, resting on long beams which are carried by cross-beams supported by four columns. The pairs of chambers are independent one of the other and of the furnace above, leaving plenty of air space for cooling purposes. This simple construction above and below is possible because of the light weight of superstructure as compared with other designs. Angular instead of curved gas and air flues are used. The other features of the furnace are the introduction of the air into the bath from an air box situated at the top of the end of the furnace, causing a very intimate mixture of the gas and air with complete combustion, and in the flame covering the whole bath from end to end. This insures quicker melting and higher efficiency during the life of the furnace and possibly a better steel. The burning back of walls and ports, with the consequent misdirection of the flame and reduction in efficiency, is prevented. The independent and replaceable gas and air flues; the thin end walls with only one opening, that for gas, and the simple general construction reduce cost and time of repairs and increase the life. It is claimed that fewer furnaces are needed for a given output because of speed attainable in production and repairs.

Costs of Reconstruction

As to the cost of reconstruction, a Bernhardt furnace

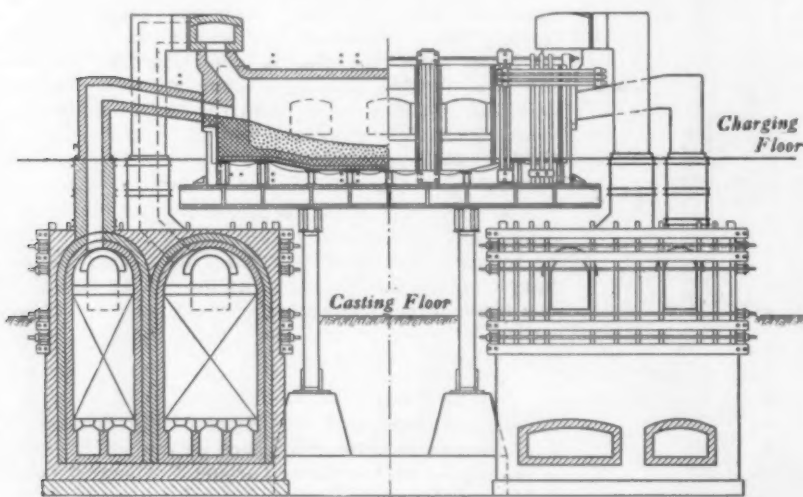


Fig. 1—A 50-Ton Open-Hearth Furnace of Bernhardt Type, Using Hot Metal

of 35 tons capacity is taken as an example. This furnace was shut down June 19, 1912, after 672 heats. The time between reconstruction and lighting up was October 26, 1911, to November 11, 1911, or 13½ working days and the cost was distributed as follows:

1. Reconstruction:	(a) Acid material.....	5814.63 marks
	(b) Basic material.....	2946.70 marks
	(c) Bricklayers	3881.60 marks
2. Repairs: Renewing end walls and air boxes after 275 heats, and minor items.....		12642.45 marks
Total		8270.50 marks
Production of steel.....		20912.95 marks
Cost of repairs, per ton.....		24292 tons
or about 21 cents.		0.86 marks

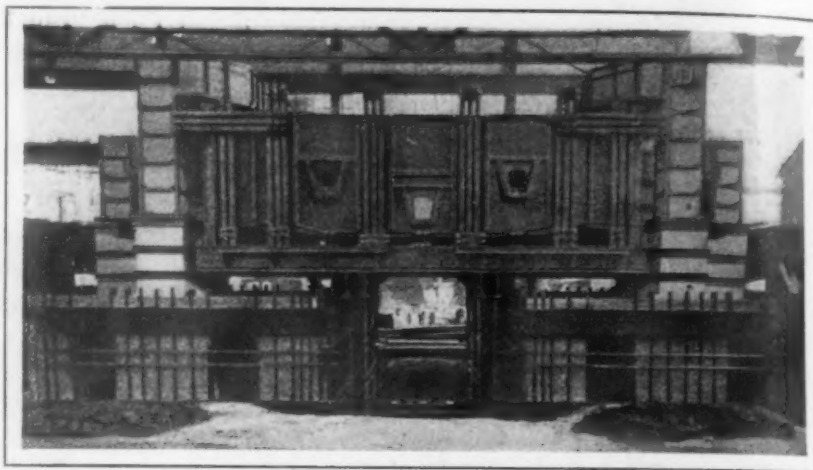


Fig. 2—Nearly Completed Open-Hearth Furnace of Bernhardt Type, Showing Construction, Also Position of Air and Gas Uptakes

In contrast with the foregoing figures the record is cited of a 35-ton furnace of the old type operated in the same plant. This furnace was shut down on May 11, 1912, after a run of 496 heats. The time between reconstruction and lighting up was November 19, 1911, to December 15, 1911, or 21 working days. The cost of this work was distributed as follows:

1. Reconstruction:	(a) Acid material.....	17224.10 marks
	(b) Basic material.....	2018.65 marks
	(c) Bricklayers	7250.15 marks
2. Repairs		26492.90 marks
Total		1506.25 marks
Production of steel.....		27999.15 marks
Cost of total repairs, per ton.....		2018.65 marks
or about 39 cents.		17220 tons
		1.62 marks

The comparison of these costs is favorable to the Bernhardt furnace, in that the production of the latter exceeds that of the old process by 7972 tons with a lower cost for repairs of 7086.20 marks. From this it follows that, per ton of steel from the Bernhardt process, there is a saving in time and in cost of repairs of 18 cents per ton, or 44.7 per cent. The saving in magnesite and dolomite is claimed to be about 15 per cent. and in coal consumption from 5 to 10 per cent.

Results in Operation

The inventor gives the following facts about the practical operation of his furnace based on actual experience. He finds that durability is increased 100 per cent. over furnaces of other designs. Thirty-five-ton furnaces, which formerly made 400 to 500 heats between periods of principal repairs, now produce 700 to 800 heats on one roof with a renewal of end walls and air boxes after 350 to 400 heats—a matter of 2 to 3 days only. By "principal repairs" is meant the rebuilding of the whole superstructure down to the gas and air uptakes except the hearth, which endures several years. This consumes, without renewing the checkers, 6 to 8 days, and with this renewal, 8 to 10 days. The checkerwork lasts over 3000 heats, gas and air flues 1500 to 1800, and the operating time of a furnace increases over 40 working days per year.

One steel works with three 35-ton furnaces using cold charges gave the following results: From January 1, 1912, to September 30, 1912, there were 229 working days or 687 for the three furnaces. The total actual working days for all the furnaces are shown as follows:

181 working days with 3 furnaces operating.....	543 days
48 working days with 2 furnaces operating.....	96 days

229 Furnace working days 639

Therefore there were $687 - 639 = 48$ repair days, or only 6.69 per cent. of the total furnace days.

The production of these three furnaces in the nine months was 87,072 tons of ingots, or 126.7 tons per each working day (687). These results would have been better if the third furnace had been built according to the new design.

The article concludes with the statement that nine of these furnaces are in successful operation in Germany. The 50-ton furnace shown in the illustrations has been operating only a short time, but with cold charges produces in 24 hours an average of 185 tons of ingots. The production of two Siemens-Martin furnaces of 50 tons capacity was 9434 tons in the first month of operation.

A New Manufacturing Type of Milling Machine

Recently a new manufacturing milling machine of the Lincoln type with a constant-speed single pulley drive has been developed by the Kempsmith Mfg. Company, Milwaukee, Wis. The range of the machine is $36 \times 12 \times 12$ in., and an individual motor drive, as illustrated, can be supplied or the machine can be equipped with a single pulley drive to be belted directly to a lineshaft.

The base is cast solid without legs and has a large oil pan to protect the floors. A handwheel at the right of the machine provides for a quick return for the table which has a working surface of 42×13 in. At the front of the machine a handwheel serves to raise or lower the headstock, the change in the location of this wheel from the top of the head frame being a special feature.

The spindle which is short and heavy has a No. 11 Brown & Sharpe taper hole and is slotted in the front end to give a positive drive for the arbor. The outboard support is rigid and it is emphasized, provides a positive alignment for the arbor, preventing it from being thrown out of line when heavy cuts are being taken. The starting or stopping of the spindle is accomplished by one of two levers at either side of the bed. The spindle is driven by a steel worm and heavy phosphor bronze worm gear running in an oil tight case, and all the spindle driving shafts run in Standard roller bearings. Six spindle speed changes are provided by change and sliding gears which are mounted on the machine. The longitudinal feed for the table also has six changes and is obtained in the same way, all feeds being controlled by one conveniently located lever.

An oil pocket is regularly provided in each machine for lubricating the cutters and large pockets in the headstock supply the lubricant required by the spindle.

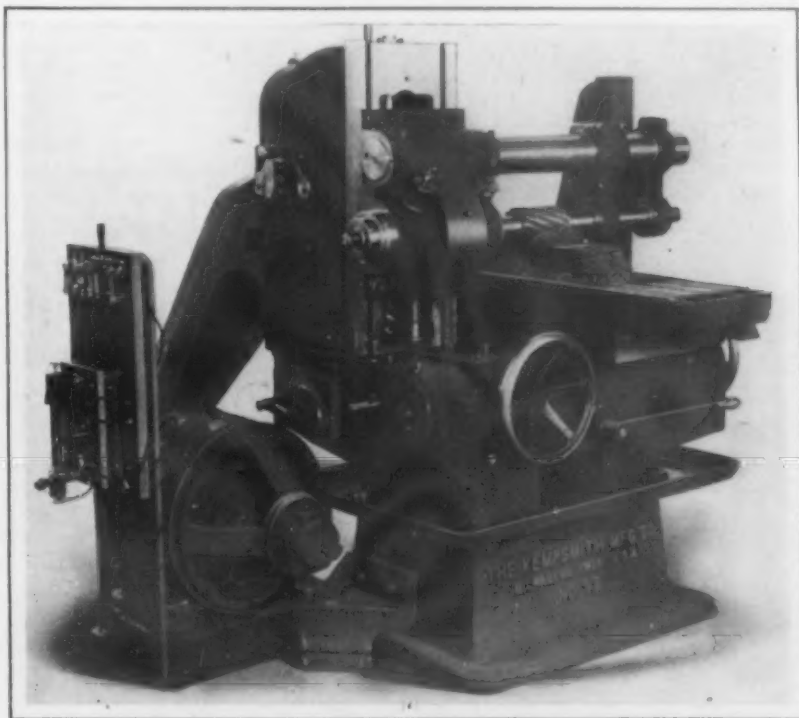
The Cleveland office of the Detroit Stoker Company has taken an order from the American Locomotive Company for a stoker to operate a 300-hp. boiler at the company's Allegheny, Pa., plant and stokers for two 250-hp. boilers to be installed in the plant of the New Castle Steel & Iron Company, New Castle, Pa. Among other orders recently received are stokers for 1200 hp. for the Bohlen-Huse Ice Company, Memphis, Tenn.; 4500 hp. for the J. I. Case Threshing Machine Company, Racine, Wis.; two 500 hp. for the Richmond, Fredericksburg & Potomac Railroad, and one 150 hp. for the Colonial Ice Company, Cleveland.

Cleveland Metal Trades Superintendents

At the annual meeting of the Metal Trades Superintendents' and Foremen's Club, of Cleveland, Ohio, held March 22, officers and committees for the year were elected as follows: President, L. W. Bosley, Cleveland Hardware Company; vice-president, Benjamin D. Fuller, Westinghouse Electric & Mfg. Company; treasurer, F. W. Seberlin, Hill-Clutch Company. Executive board, the president, vice-president, treasurer, and J. H. White, Baker Motor Vehicle Company; George Hawn, Ferro Machine & Foundry Company; Thomas Ferry, Ferry Cap & Set Screw Company; Adam Herkner, Warner & Swasey Company. Membership committee, Emil Geiring, Rauch & Lang Carriage Company; C. Fleming, Ferro Machine & Foundry Company; S. S. Bolton, Chandler & Price Company; Karl Neff, Warner & Swasey Company; W. S. Valmore, United Brass Mfg. Company. An address was delivered by H. T. Peterson, manager of the Charles A. Schieren Company, Pittsburgh, on "Leather Belting from Tannery to Pulley."

Standard Steel Company Organization

The Standard Steel Company, Birmingham, Ala., announces under date of March 27 that it has purchased from the trustee in bankruptcy all of the lands, works, merchandise, accounts and business of the Southern Iron & Steel Company and of James Bowron, receiver and



A New Manufacturing Lincoln Type Milling Machine with a Constant-Speed Single Pulley Drive

trustee. The Standard Steel Company will discharge all the current obligations of the receiver and will perform all his uncompleted contracts. The various departments of the company are in charge of the same officials as heretofore, the organization being as follows: President, James Bowron; vice-president and general sales agent, H. Sanborn Smith; secretary and treasurer, A. R. Forsyth; purchasing agent, B. F. Tyler; assistant purchasing agent, L. E. Geohagan; auditor, T. M. Nesbitt; assistant general sales agent, C. C. Brown; superintendent of mines, J. E. Strong; manager of steel works, Alabama City, C. A. Moffett; traffic manager, H. H. Knight.

The Globe Iron Company, Jackson, Ohio, has made extensive improvements at its blast furnace plant, consisting of a skip hoist, steel bins and trestles, electric larry and transfer cars, traveling ore bridge, cast house electric crane with magnet, ladle cars for handling liquid slag, two gas whirlers connected in series, electric power plant and new boilers and pumps. The furnace has been out of blast since June 1, 1912.

Interest in Employees Beyond the Works

What the Cleveland Hardware Company Is Doing with a Visiting Nurse and by Displaying Daily Records of Shipments

Welfare work in several interesting forms is being carried out by the Cleveland Hardware Company, Cleveland, Ohio. This company has also recently installed an original method of arousing the interest of its employees in plant production by setting a standard of output and having the men watch from day to day the company's output as compared with its record-breaking year, the comparative amount of shipments each day being seen by a glance on the charts posted throughout the shops.

A Visiting Nurse and Her Duties

Many manufacturers who devote considerable attention to welfare work among their employees do not carry that work beyond their factory doors. Believing that much more far reaching and more effective results can be accomplished by carrying this work into the homes of the employees, the company adopted a plan of having a visiting nurse call at the homes of its employees to render such assistance to them and their families as may be required. This woman visitor acts in the dual capacity of nurse and

in the new building of its No. 1 plant a dispensary and operating room that are as completely equipped as similar rooms in first-class hospitals. Following the usual hospital practice the room has white tile walls and floor and a skylight, making it sanitary and providing an abundance of light for surgical operations. In addition to a reception room, separate rooms are provided for men and women for dressing injuries. The dispensary is intended for first aid to the injured, but the equipment makes it available for use by a physician should an employee's injuries be such as to necessitate an operation before removal to a hospital.

Any employee is at liberty to consult the nurse about his own ailments or sickness in his family. In the latter case the nurse goes to the home and gives such services as are required. All absentees are reported to the nurse and she visits their homes, rendering such services as may be needed in case of illness, and making a report to the company regarding the case, this report showing whether the absence was caused by the illness of the employee or a

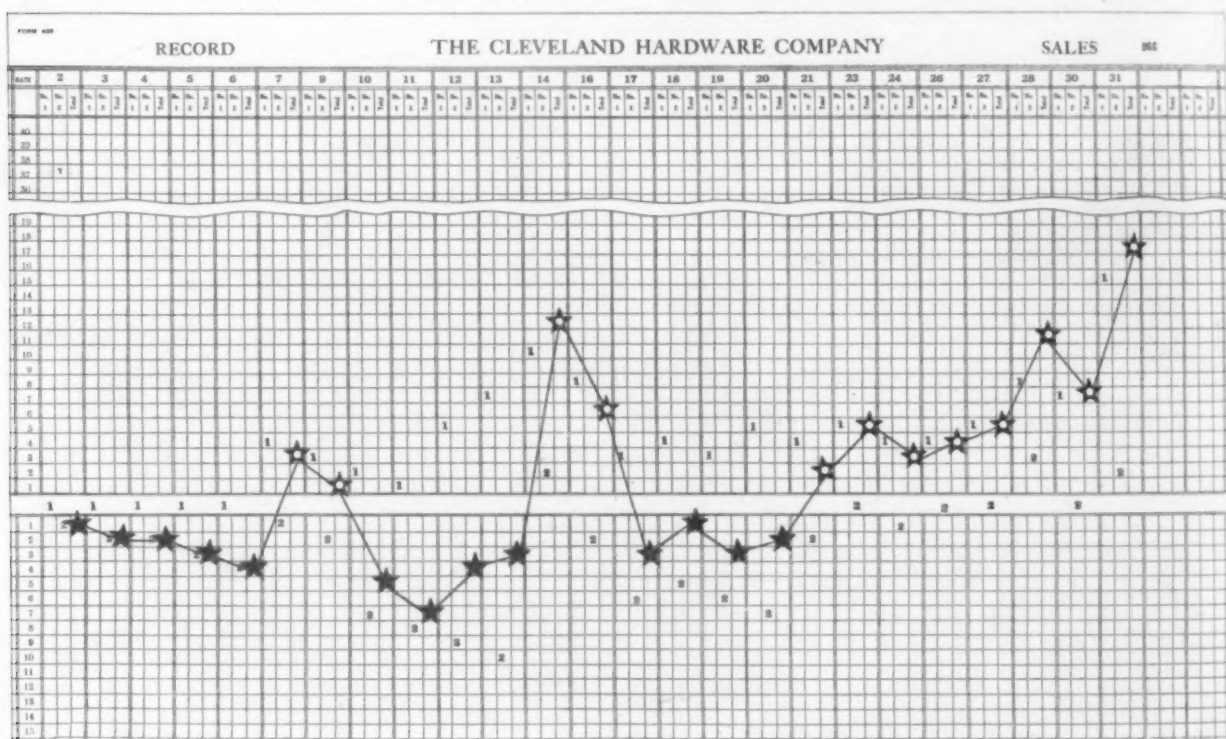


Chart for Employees, Showing Daily Fluctuations in Value of Shipments Above or Below the Highest Average for the Same Previous Month; Chart is About 21 In. Wide; the Stars Above the Average Line are Blue; Those Below are Red

social worker. The practice has proved so successful that in the past year at least six other Cleveland manufacturers have adopted similar plans of visitation by nurses.

The company has one nurse who spends her entire time in looking after the health and comfort of its employees and their families. Instead of directly engaging a nurse for this work, the company secures a nurse through the local Visiting Nurses' Association, paying that association for the nurse's entire time. This method is regarded as more satisfactory than having a nurse directly under the supervision of the company, for the reason that under the method followed the nurse is under the direction of a trained superior who can supervise her work and a substitute can be readily provided in case the regular nurse is ill. The nurse spends the first hour in the morning at one of the company's two plants and the first hour in the afternoon at the other plant, the two plants being in different sections of the city and a considerable distance apart.

These two hours are taken up with dressing slight wounds and consultations.

In connection with this work the company has fitted up

member of his family, or whether the employee stayed away for some reason other than illness. The company has about 1500 employees and among these and their families, the nurse attends to from 200 to 300 cases per month.

The Nurse as a Social Worker

The management realizes that a man's efficiency is impaired not only by his own poor health, but also by conditions in his home. If his wife is ill, or he has a sick child, he often suffers from the loss of sleep, and at any rate his peace of mind is affected, and he is unable to do his usual amount of work. In the experience of the company sickness at home almost invariably cuts down an employee's piece work. The visiting nurse knows where the employees live, and when making a sick call she visits in her capacity as social worker the homes of other employees living in the same neighborhood. The company aims to have the nurse visit the home of every employee at least once a year, in order to study the family surroundings and do what she can as a social worker to improve home conditions.

To increase the personal interest of the men in their work and in the company, and its production a plan has recently been adopted of displaying a chart showing the volume of shipments from day to day as compared with the mark the company hopes to reach or exceed each day. The pace set is the output of its high record year. This chart, which is shown in the accompanying illustration, is filled out on large blanks made up of small squares. The chart is divided into two sections, the dividing line between the two sections representing the shipments for December in the best previous year. Spaces are provided on the chart to show in thousands of dollars the value of shipments from each plant each day of the month as compared with the record aimed at. Each day stencil marks are made on the chart in the proper squares to show the comparative money value of shipments on that day, and the total gain or loss is indicated by a star pasted in the proper location. Blue stars represent a gain and red stars indicate a loss. The rows of figures at the left of the chart represent thousands of dollars. The chart is very simple and can be read at a glance. For example, the December 16 shipments from the No. 1 plant were \$8,000 in excess of the corresponding day of the record-breaking year, and the shipments from the No. 2 plant show the falling off of \$2,000, making the net gain for the day \$6,000, as shown by the star in the column provided for the total of the day.

Use of Charts Showing Daily Fluctuation in Shipments

These charts are sent to the 80 sub-foremen in the two plants and are posted up in different places throughout the shop. Each day the score is set up by making the stencil mark and pasting the star in the proper squares on the chart. In this way a great deal of interest has been aroused among the men. Not only are they eager to have a better showing made than the amount aimed at, but competition has been aroused between the two plants making similar products, which are mostly automobile forgings, the men in one plant being anxious to have their plant show up better than the other.

In March this plan was carried a step further by sending daily to the homes of the sub-foremen a postal card with the score or record for the previous day pasted on a printed form for one day only on the back of the card. In this way not only is an interest in the volume of production aroused among the sub-foremen, but their wives and children, it is found, have become enthused and watch for the daily reports, and the amount of work that is being turned out from day to day becomes the subject of fireside conversation. In this way the shop production becomes a matter of human interest not only to the foremen but to members of his family.

A Weekly Educational Letter to Sub-Foremen

More along the line of educational rather than welfare work, E. E. Adams, general superintendent of the company, sends to the 80 sub-foremen a weekly letter, in each of which he takes up some general practical topic of special value to the men, but avoiding matters that pertain to small shop details. In these letters such subjects as cleanliness, fire hazards, the need of keeping a shop neat and orderly, the fact that a foreman must not only have personal knowledge but must also be able to teach others are discussed. He also includes in his weekly letter a report of every accident, discussing how it happened and how it could have been avoided.

When the system of weekly letters was inaugurated one was sent out containing a biographical sketch of each sub-foreman, thus enabling the men to know something about one another and tending to broaden the views of the men in the shops. Following this policy further the company has its superintendent's and foremen's table in the dining rooms, where these men come in personal contact, exchange views, and in this manner help one another. Believing that business men learn a great deal by mingling at noon-day lunch, the company holds that its foremen are similarly benefited by coming together.

A Safety Committee and Its Duties

The company has a safety committee consisting of one man from each plant, appointed by the plant superintendent, who makes investigations that will result in the prevention of accidents and the preservation of health. While this

committee is always on the lookout for conditions that might be improved, the members are given a half day each month during which they spend their entire time investigating, as they see fit, the company's plant, or looking into conditions and devices of other plants with a view of suggesting improvements in their own.

Mr. Adams, the general superintendent, has long taken a very active interest in welfare work in Cleveland, and gives much attention to this work among the men under him. While carrying out certain well defined plans for the improvement of the men and keeping up the interest in their work, he makes the effort not to allow his efforts in this direction to run in a rut which might have a tendency to make them less effective. Accordingly he frequently devises some new plan of appealing to the men which, after being used for a time, is discarded for something different.

Exhaust System for Grinding Wheels

A pamphlet entitled "Specifications for the Design, Construction and Operation of Exhaust Systems for Grinding, Polishing and Buffing Wheels" has been prepared by William Newell, mechanical engineer of the New York State Department of Labor. The specifications are issued with the view of bringing about the efficient removal of dust from grinding and buffing wheels, and their object is to prevent the construction of exhaust systems along faulty lines. Some of the common faults which these specifications are designed to correct are the making of the main suction duct much too small and not infrequently the same size throughout its entire length, making right angle connections between the branch pipes and the main, and the provision of an entirely inadequate suction as a result of using fans, discharge pipes and dust collectors which are too small. These specifications are also educational in character and are designed to prevent manufacturers from having useless systems which cannot be accepted by the department installed by ignorant or careless contractors. Following the specifications there are a number of recommendations and a drawing showing an exhaust system laid out in conformity with the specifications for eight 14-in. emery wheels is included.

Points for Large Coal Consumers

"Sampling Coal Deliveries" is the title of a 68-page pamphlet which has been issued by the Bureau of Mines, Washington, D. C. This pamphlet bears on the purchase of coal under specifications depending on its heating value. Types of Government specifications for the purchase of coal are given, and the statement is made that more than half of the coal now used by the Government, the total value of which approximates \$8,000,000 annually, is purchased under specifications. Under the authority of acts of Congress a laboratory is maintained at the headquarters of the Bureau of Mines, Washington, where samples representing deliveries of coal purchased under specifications for Government use are analyzed and tested. At this laboratory more than 1200 samples have been analyzed and tested in one month. The pamphlet gives the methods which are followed in preparing the samples for the purpose of testing and illustrates the apparatus used in the several operations attending this matter.

On Saturday, March 8, was inaugurated a new foreign trade between Plymouth, Mass., and Yucatan which adds much to the commercial importance of the historic Bay State town. A British steamship entered Plymouth harbor with a cargo of 6030 bales of Sisal fibre for the Plymouth Cordage Company. This was the first foreign steamer that ever docked at Plymouth. A recently dredged channel from the ocean to North Plymouth, about three miles long and 18 ft. deep at low water, is entirely adequate for vessels carrying fibre which, although bulky, is not of great weight. The channel at high tide is 26 ft. in depth. In addition to the dredging of the channel the coming of the new foreign line had been prepared for by the building at North Plymouth of a stone pier and fireproof warehouse for the reception and storage of the fibre.

Some Precepts for Machine Tool Salesmen

Factors to Be Considered in Selling Special Machine Tools—Mechanical and Commercial Knowledge and Good Salesmanship Work Together

BY FRANK M. ELLIS

Machine tools may be divided under two general headings: standard and special. Under the heading of standard we generally list such machines as engine lathes, planers, drill presses, knee-type milling machines, shapers, etc. Under the heading of special are such machines as planer type milling machines, automatic screw machines, internal grinders, semi-automatic cylindrical grinders, automatic chucking machines, hand screw machines, heavy semi-automatic turret lathes for both bar and chucking work, and in some cases the vertical boring and turning mills.

How Selling Methods of the Two Classes Differ

The principal difference in the selling of these two classes of machines is that the standard machine tools are generally sold by featuring their design and the sale does not include special equipment as the buyer usually makes his own tools or uses some he has on other and similar machines; whereas special machine tools are generally sold by featuring their production or the saving in labor cost that can be obtained by their use. In most cases special machine tools are sold under a production guarantee given by the maker. This usually involves a demonstration in the buyer's shop by an operator or expert in the maker's employ. The demonstration in many cases involves the use of a tool equipment made to handle the particular work for which the machine was purchased, so in reality such sales also involve the sale of this tool equipment in addition to or with the machine itself.

Controlling, or underlying, all sales of machine tools are certain basic principles. Some men learn these by studying courses in salesmanship given in schools and colleges, or by the correspondence method, either of which makes a good beginning. Other men get their start in the open school of salesmanship, that of "hard knocks." Without question any study course in salesmanship, if properly planned and earnestly followed, will help. We all know, however, that the finishing touches are obtained in the open school of hard knocks. The basic principles obtained are the same in either case and a review of them may be of assistance to all in the selling end of business. Some people and firms retain the idea that real salesmen and poets are born, not made. This is an old and exploded idea for where would the poet be without his training? And likewise with the machine tool salesman. It is true that some men make better salesmen than others, but any man in the trade who will study his machine and its uses and will properly apply himself can develop and in time be a better salesman.

Mechanical and Commercial Knowledge Work Together

Most progressive firms building special machine tools sell their product direct to the user or at least have men in their employ who devote all their time helping the agents or dealers doing what is commonly known as missionary work. Men selected to sell special machine tools are generally recruited from two sources—the work-shop of the maker or the force of operators employed by the users and for them to be successful there are two principal requisites:

- 1—Mechanical knowledge.
- 2—Commercial knowledge.

Very fortunate is the salesman who reaches the top in both branches. When he does, his employers generally lose an excellent road man by appointing him to an official position and it is well that they do so as no one knows better than such a man how a firm can best serve its customers. Most men excel to some extent in one branch or the other. There is so much of each to demand a man's attention that most firms work two men in a given territory—one to look after the operating or mechanical end, and the other the selling side of the work. Usually the salesman is responsible for the work of both.

The operating or mechanical side of selling a special machine tool is just as important as the commercial, in fact neither can go far without the other. When an operator handles his work properly he can make it just as important as that of the salesman—indeed he can in truth be a salesman and no distinct line can be drawn between these two parts of selling and no definite rule or set of rules can be laid down for either one to follow. The salesman must try to apply as much as possible of what he sees and learns to that which he has to do.

Knowledge Without Application of Little Use

Educators and men of that class are considered very learned, and usually they are, but they are not always practical men, one reason being that many of them do not and perhaps cannot read between the lines and apply that which they have read and learned to new things and new requirements. So it will be with any man if he only tries to memorize what is written on salesmanship and the art of selling. It is not what he reads and memorizes but rather how well he can apply the principles that will help him to develop and climb the ladder of success.

To make a real success of any business a man must like his work; more than this, he must apply himself and work hard. He must be a master of himself, know thoroughly the machine he is trying to sell and have a knowledge of the elements that go to make up a sale. First of all the salesman must realize that a sale is never made until at least two minds come to an understanding, in other words, not until both customer and salesman hold practically the same viewpoint regarding the machine being sold. The salesman must learn how to make the customer see the value of his machine by studying the mental laws required in the practice of salesmanship and how these can best be used to persuade the customer to purchase. Without apparently attempting a sale, as an example, the salesman can show the prospective customer the advantage or benefit that would be derived by the use of a machine he has to sell. This may be done in several ways, but if properly handled the result is the same. The salesman brings the prospect to his point of view, first by knowing him and what he has to do, and then by showing him how, with a particular machine, the desired work can be accomplished in the best and most economical manner. The order follows as a natural result, but without first building a good foundation a sale will seldom be made even though there has been some eloquent talking.

Guarding the Buyer's Interest Means Future Business

The successful salesmen of special machine tools are not alone masters of the machines they sell and of the work these machines will do, but they appreciate that true salesmanship is business building. In other words he only sells his customer what is really best for the work contemplated, taking into consideration the buyer's entire shop and business—what work he has to do and also what he will likely have to do before another year goes by. This in some cases may result in the immediate sale totaling a few dollars less, but it will be building one of the greatest of business assets, a customer's confidence in the salesman and his judgment and in that of the firm represented. Then, when the buyer comes into the market again he will be very apt to consult first with those with whom he dealt before. In describing a machine a salesman should be sure to start with his prospect on common ground, that is, start with his point of view and his problems, then by proper description bring him up to the desired point of view. It is necessary to be logical for only by giving good reasons as to *why* and *how* can a customer be convinced of the absolute truth of the statements made to him. Men differ and accordingly must be handled in different ways. A prospect and his problems must be studied and a ma-

chine presented to him in a true logical manner that will interest him, by featuring the points that apply the best to his requirements.

As stated heretofore, most special machine tools are sold under a guarantee, and in some cases the customer will be satisfied by the guarantee without even going into the details of design; whereas others will have to be shown just how the machine is built. A salesman should never enter an argument on machine tool design in general, as such arguments seldom lead to sales. It is hard to find two mechanics or engineers who will agree on details of machine tool design and the time spent will only be wasted. If one remembers he is to sell machinery he will find little time for anything else. As a case in point, the writer remembers a time when, in doing missionary work, he went with a dealer's salesman to see a prospect in regard to a special machine tool under consideration. This salesman thought himself a man of considerable engineering ability. Shortly after the interview began the machine shop foreman came in to inquire about the table speed of a 4 x 4 x 16 ft. planer which had just been purchased and much to the writer's disappointment the entire time the prospective customer could give was spent by the dealer's salesman in arguing planer table speeds. So far as the real mission of the visit was concerned the time of three men was entirely wasted. The next day another visit, this time without the agent's salesman, resulted in a sale shortly after.

Whenever it is known that a prospective customer favors another make of machine, the salesman should not mention any but his own. He can describe how his machine meets and possibly excels the machine that is favored by the prospect, but he ordinarily has enough to do in properly explaining his own machine and its work without taking time to talk about a competitor's. A description should begin with some point or feature of design that the salesman is sure the customer understands fully and on which it is agreed that the machine being discussed excels. Then by carefully building up the description it is possible, in many cases, to bring the customer to the salesman's point of view.

Mental Steps Which Precede Decision to Buy

To the casual observer no two sales are made alike and still if a few such transactions are analyzed they will each be found to contain certain things exactly alike. These are the essential points of a sale and must be watched by every salesman: Attention, Interest, Desire, Conviction, Action. Real action is best shown by the customer writing the order. Every one knows this will never be done until he has been convinced on every point; that he cannot be convinced until he has felt a real desire to own or use what is offered; also, he will not have this desire until he has been thoroughly interested, and this can only be done after his favorable attention has been obtained. This is reasoning backwards, but it will be seen that after the customer's favorable attention has been secured, and he has been interested enough to create desire, it will not be hard to convince him that he needs the machine in question, after which comes action and the sale is made.

Study of a few sales will show that they crossed to success on the stepping stones named: Attention, Interest, Desire, Conviction and Action. This being true it will help a salesman if he watches his sales and sees that he works with his prospects along these lines. Always build a good strong foundation first or the whole structure will fall when the storm of competition comes along. Be sure you have your customer's undivided and favorable attention. Don't waste his time and yours in talking points of merit when you know he is really thinking of something else, or in other words, when he is not listening attentively. Therefore it is well to have him alone or with only those equally interested. Look them (or him) straight in the eye as by the eye you can follow their thoughts and tell what amount of interest they are taking in what you have to say.

Great Care Necessary in Matter of Suggestion

At all times the value of suggestion must be kept in mind as it has a great value. A crude example, but a good one, is of a man walking down a busy street. So long as he goes ahead the same as any one else he is not noticed, but let him stop and gaze steadily up into the sky for a minute or two and he will first attract attention, then his action will suggest to others that they want to look

up and without a second thought they do so. Suggestion is truly a wonderful power, yet few salesmen fully appreciate to what extent they use it nor to what extent they may use it. Inasmuch as the mind will act oftentimes on what is suggested the salesman should make his presentations, or suggestions, in such manner as to make the resultant action favorable. Use only positive suggestion, never make a statement or act in any way that will suggest to a prospect's mind that you are not strictly honest, thoroughly in earnest, and a master of your machine.

At times a prospect will want to see a machine in operation, so in mentioning users or suggesting a visit to another shop where machines are in use be sure to use so far as possible only names of some friend or acquaintance whose business judgment is admired or respected by the prospect as thereby his interest is increased and a positive suggestion is conveyed. Never mention a user with whom the prospect is not friendly or a man he does not respect, as the effect is that of a negative suggestion and will surely lessen the chances of making a sale.

After a proper start and by logically describing the machine, whose sale is sought, it will sooner or later reach a point where the prospect's opinion is wanted and a direct question must be put to get it. Here a salesman must be careful to so frame his question that it cannot be answered by yes or no. Take, for instance, a question framed along this line: "Now, Mr. Jones, don't you agree that this machine will do all we claim for it?" If he agrees, all well and good, but if he does not he will in most cases give his reasons and open a new line of attack and the description can be gone into further, particularly on the point he has raised.

Had the question been: "Now, Mr. Jones, don't you think this is the machine you want?" His answer, if unfavorable, would in most cases close the interview and the salesman would soon find himself on the outside. Whereas, by a question properly formed an answer can often be obtained that will give an opening by which failure can be avoided.

Getting and Sustaining Attention and Interest

In watching the progress of selling effort a salesman should not be deceived; he must study his prospect and quickly detect assumed attention on the latter's part. He should remember that he can, to a large extent, control the customer's attention by the degree of his own earnestness and that if he goes at it in a half-hearted manner his prospect will give very little of his time. To get attention a machine may be used, but more likely a picture. It is better if a machine can be shown and best of all a machine in actual operation. There are exceptions to this, of course, for some purchasers will know very little of the mechanical side of a proposition. By proper study they can be read and it be determined whether they are most interested in the features of design or principally in the saving the machine will effect. The details must be made to fade before the light created by a demonstration of the saving and value of the investment.

Real interest can often be aroused by using something foreign to the actual object in mind. For instance, by using pictures of the shop in which machine tools are made, one can get attention and by describing how the machines are built, the extreme care used in their construction can be shown. Featuring how the machines are used on work in the shop where they are made gives an opportunity to quote some of the savings effected, possibly on parts that are like those the prospect has to make. This course is likely to carry the prospect directly from attention to interest. Unless the prospective buyer is properly interested some kind of demonstration is often required, either for the man considering the proposition, or one of his employees. Thus will interest be developed and real desire created, and if proof is required a demonstration is the highest kind of proof.

Even if the prospect has similar machines in use a demonstration will often help if interest is lagging. He should be shown a newer machine than he has in use and the changes and improvements pointed out. Here it should be ascertained what particular features attract him most and attention directed to them during the demonstration, but care should be taken not to overload at any point. In other words, tact must be used. Showing a machine gives an added opportunity to get better acquainted with the prospect as he is away from the office environment.

It should be remembered that a prospect will have a general interest in many things a salesman says and shows for which he never will have any real need or desire, so it is best to weed out all but that which is of material interest to him, for which he has felt a need or for which a need can be shown. It is up to the salesman to determine these points of material interest and by showing how his machine will fill a want, thereby create real desire in the prospect's mind. Once the point of desire has been reached it is not hard ordinarily to convince and get the desired action which means making a sale.

The Tactful Departure on Closing a Deal

The closing of a deal in the machine tool business assumes several forms. Sometimes the salesman gets the actual order at once, particularly when dealing with a small firm of which the prospect is the owner, and also when dealing with a man of sufficient authority to issue the order himself. In other cases the transaction may only go far enough to get the word of one in authority, that a certain machine is the one to be bought, after which the red tape of business takes its usual course. This is usual in the cases of very large firms and railroads. Once a salesman has an order or the promise of an order and is certain confirmation will follow in due time, his next move is to get away. This should be done as quickly as dignity will permit, but not as if he were sent for. He should promptly bring his conversation to a close and leave and not stop to crack jokes or tell stories. Many a man has talked himself successfully into an order and out of it again before he got away. Here again tact is very essential. One should be a good listener as well as a good talker. Some men will do the selling for you if they are listened to judiciously. Judgment must tell when to talk and when to listen.

Opening of a Foundry Laboratory

The new laboratories of the H. M. Lane Company were formally opened Saturday evening, March 22, by a reception to the Detroit foundrymen, which was attended by about 100 persons. Refreshments were served from 6 to 7 o'clock. Everything that could be baked was baked in a core oven. A gas-fired oven was used and the temperature was regulated by a number of attached thermometers. Each man's lunch was placed in a foundry pail, and according to the most modern core room methods these were delivered to the visiting foundrymen by a gravity carrier, the buckets furnishing seats for the guests.

These laboratories are the outcome of the research work which has been carried on by H. M. Lane during the past 10 or 12 years. They are located at 18 East Piquette avenue, Detroit, and occupy some 5000 sq. ft. of floor space. The offices and drafting room are located at the front of the building. Back of these is the chemical laboratory, which is 15 x 40 ft. The remainder of the main building and the adjoining building are given up to the working core room and model foundry plant, containing the latest appliances in foundry equipment. The objects of the laboratory are: To study core sands and core binders, so as to find the best mixture for the conditions present in different plants; to study new core binders in order to ascertain their exact value to the foundry; to determine the best method of mixing sands and binders for different classes of cores or molds. A careful study is also made of the proper baking temperatures, baking times and different core oven fuels. Special machinery is being installed for cleaning and recovering old core sand.

In the foundry department are a melting furnace and appliances for pouring molds so as to test both cores and molds. A room at the rear of the building is fitted with microscopes and cameras for the study of core problems.

In establishing the laboratories Mr. Lane has had the co-operation of a large number of manufacturers of equipment. The demonstration plant is run as a permanent exhibit, which is of interest to manufacturers from three angles: First, the research work being carried on in the laboratory is developing improvements upon existing machines and even developing some entirely new machines; second, the equipment is being brought to the attention of foundrymen who visit the plant; third, one of the features of the exhibit is that the manufacturer showing equipment has the privilege of bringing prospective

customers to the laboratory and there demonstrating his equipment as a part of a complete working model foundry. If the machine be a sand mixing machine the mixed sand may be made into cores, baked and the cores tested or subjected to casting conditions.

The Export Trade in Machine Tools

European Conditions as Viewed by a Cincinnati Manufacturer—The Tariff as a Factor

Conditions relating to machine tool exports, especially as applying to Europe, change so frequently with the trend of industrial development on both sides of the water, that late views on the situation are always of interest, particularly when they represent long experience on both the manufacturing and the selling side of the trade. Murray Shipley, of the Lodge & Shipley Machine Tool Company, Cincinnati, who has given much attention to machinery exports, recently returned from a four months' trip through continental Europe, devoting most of his time to studying the problems of the machine tool trade. His idea is that the European market will have to be watched more closely if American business is to be extended. American manufacturers, he believes, must cooperate more closely, if they expect to be successful in meeting European competition.

"The average American firm," Mr. Shipley says, "does not realize that an order obtained by one of its American competitors, as against foreign competition, in reality is an aid to all American manufacturers in procuring a full share of business in any particular foreign field. Until our people realize that it is necessary to work more in harmony with each other, as particularly the Germans are doing, we will not be able to make the showing in the export line that we should."

Referring to the observance of business customs in different countries, Mr. Shipley cited an instance of an engagement made with a foreign customer for 5 o'clock in the afternoon. The ensuing conference lasted over two hours, terminating much later than the closing time for the average American office. The time had been suggested by the customer, and such late hours are not unusual in this particular country. American travelers find some difficulty in adjusting themselves to this as well as some other customs, but success naturally requires conformity with them.

Mr. Shipley's ideas on the tariff question coincide with those previously expressed by a number of other prominent machine tool builders. He emphasizes the danger of competition in this country from both England and Germany, in case the tariff is removed from machine tools. An instance was cited in which his own firm had shipped a lathe to a foreign concern, which in turn shipped it to a manufacturer. The latter dismantled it, and without making any patterns at all put the different parts in the sand, and so far as the shape of the castings is concerned the name plate only would indicate which firm built the machine.

In this connection Mr. Shipley called attention to the fact that American machine tool builders have spent, and are still spending, large sums of money in developing machine tools of all kinds, and that foreign patent laws do not afford adequate protection, unless the holder of the patent manufactures his machine in the country where the patent is taken out. This matter is overlooked by the majority of our law-makers, in connection with the tariff. The European manufacturer who has the advantage of duplicating American tools, at least in appearance, and selling them in competition with domestic made machines, would be able under free trade conditions, to get considerable business right at our own doors, as he will be free of the heavy experimental and development charge which progressive American shops must meet, and his labor cost is considerably below our own.

Mr. Shipley believes that the American manufacturer must continue his campaign of building higher grade tools; that he must also go after the export trade more vigorously and in a personal way, not depending so much on importers on the other side.

Sheridan furnace, of the Berkshire Iron Company, Sheridan, Pa., has been blown out for needed repairs.

Tool Steel for the United States Navy

Method of Testing Tool Steels to Determine Contract Awards—Bids for Annual Supply to Be Opened April 8

In view of the fact that bids for the annual supply of tool steel for the United States Navy Department are to be opened April 8, the subjoined notes from a paper on "Tool Steel for the United States Navy," by Lewis H. Kenney, M. E., Navy Yard, Philadelphia, are timely. The paper was presented last November before the Society of Naval Architects and Marine Engineers and besides dealing with the testing of tool steels to determine the award of contracts, reproduced specifications issued since the Philadelphia Navy Yard has been the central purchasing and testing station for tool steels for the Navy.

Previous to 1909 each navy yard prepared requisitions for the purchase of tool steels for its own purposes. The requisitions specified either proprietary material or that the contract would be awarded from information obtained by a test of samples submitted. By this method there was no uniformity in the specifications. In order to centralize the purchase and standardize the tool steels, a tool steel board, in 1909, recommended that the Philadelphia navy yard be the purchasing station and prepared specifications for one high speed and three carbon steels.

The chemical composition of the high-speed tool steel specified differed from any of the commercial steels, and the carbon steels were varied principally in the carbon content, in order to adapt them to the purposes for which such steels are generally used. The contracts were awarded under these specifications to the lowest responsible bidders. As part of the inspection for acceptance of the material, physical tests were prescribed in addition to the chemical analyses, but the physical tests never gave satisfactory or decisive results, and evidently were not coordinate with the chemical compositions. The specifications did not provide a means for either ascertaining the relative merits of the tool steels offered by the bidders or if they were better tool steels than those within the limits of the chemical compositions specified.

Latitude Allowed to Meet Physical Tests

It was, therefore, considered advisable to revise the specifications so that the bidders would be required to submit samples. The samples would be manufactured into tools and subjected to physical tests devised to investigate the relative merits. The data thus obtained would form the basis for recommending the award of contract. The chemical compositions would be given with maximum and minimum limits, in order to indicate to the bidder the kind of tool steel required, but as the physical test would form the basis for recommending the award of contract, a statement would be included to the effect that the bidders could submit samples of chemical compositions differing from those specified. The object of this provision was to introduce competition as to the qualities of the tool steels instead of simply competition in prices.

By modifying the specifications as outlined, means would be provided for learning something of the relative merits of the commercial tool steels, and for taking advantage of developments and progress made by the manufacturers. Definite information would also be obtained of the qualities of the steels before the contract was awarded.

Sample Bars Offered for Test

Specifications were prepared for the purchase of high-speed tool steel for the United States Naval Academy. The limits of the chemical composition were varied to permit bidders to submit proposals on their commercial standard tool steels, and the feature of a selective test was introduced. The selective test provided means for investigating the relative suitability of the tool steels offered, and the recommendation for award of contract was based on the information thus obtained. The specifications required each bidder to furnish a sample bar of the tool steel covered by his bid and this sample bar would be delivered to the engineer officer for him to direct the selective test. The proportion of the tool, its heat treatment

and the conditions of the test are covered by the selective test.

A lathe tool was selected for the test and it was kept cutting, without lubricant, until it failed by the cutting down of the cutting edge due to heating caused by the friction of the chip, and a record of the elapsed time of run, or cutting life of the tool, was made. By keeping the other conditions constant, the elapsed time of run was the principal variable. Each tool after failure was reground, care being taken to remove the effects of the heating due to the previous cut, and again tested until the tool broke down, after which it was reground and tested a third time.

Determining the So-Called Selective Factor

It was considered that the cutting life, as shown by the elapsed time of run described, and cost of the material were the principal factors in determining a selection, because the number of times the tools could be reformed and reground, and the cost for keeping them in efficient condition would be practically the same regardless of the quality of the tool steel. Therefore, the arithmetical mean of the elapsed time of all runs of the tools of one sample was computed and this mean was divided by the price per pound of the material. The quantity thus obtained was called the selective factor, and the tool steel of highest selective factor was recommended for award of contract.

A test was made of tool steel which had been purchased under specifications, to learn if it were equal or superior to the commercial tool steels and it proved conclusively that some of the commercial tool steels were superior.

The selective test was conducted under uniform conditions, so that the principal variable was the elapsed time of run of the tools. Electrical observations were made of the input to the motor which drove the lathe. They showed that the work done by the tools varied. It was decided to compute the work value or watt-minutes of work done by each tool first, and then adjust the work values by the principles of least squares instead of elapsed time of runs, as was done in the previous test. By the previous method an observation of the elapsed time of run of a tool might vary so greatly from the mean that it would be rejected, although the watt-minutes of work done by a tool might not vary sufficiently from the mean work value to necessitate rejection. The work done by a tool which is indicated by the elapsed time of run and the watts consumed is an important factor in determining selection. It was decided therefore that the work value of each tool was a fairer value.

Selection of Carbon Steels, Including Tungsten

The information obtained from the selective test conducted on high-speed tool steel indicated that it was advisable to revise the specifications for carbon tool steels and a selective test similar in character and purpose to that previously described was introduced. Four classes of carbon tool steel were selected which varied principally in their carbon content. The conditions throughout the selective test were maintained as nearly constant for each class of tool steel as facilities would permit, and the elapsed time of run, or operating life of the tools, was the principal variable in the test, because the tools were operated until they broke down.

The milling cutters for the selective test of carbon tool steel were operated until they broke down either in the shank or teeth. The elapsed time of run of the cutters was recorded and represents the total time the cutters were operating, but does not include the time required to return the milling machine table to the starting point and to set for the next cut. The selective factor represents the ratio of the mean elapsed time of all cutters of one sample and the price per pound of that sample. The relative values were computed as previously described for tungsten tool steel.

The conditions throughout the selective test were maintained as nearly uniform as facilities would permit, and the operating life of the tools determined as previously described. Before the tools were treated a determination was made of the recalcrescent point of each sample to assist in selecting suitable treating temperatures. Some of the bidders took advantage of the clause in the specifications which permitted tool steels to be submitted of a chemical composition differing from that specified. Tool steels containing tungsten were submitted under carbon tool steels, and a tool steel containing chromium was submitted under carbon tool steel.

Treatment of Sample Bars Prior to Test

The five tungsten steel tools made from the sample bars are stamped with the schedule number, an index number assigned to each sample, and consecutive numbers for the tools of one sample. All tools are hand-forged to the No. 30 lathe tool fork of the Sellers system of tool forms. The following day the tools are treated, two furnaces being required for this purpose. In one furnace a temperature of 1600 to 1700 deg. F. and in the other a temperature of 2400 deg. F. are maintained. The tools are uniformly heated in the low-heat furnace and then in the high-heat furnace. The temperatures given do not indicate the temperature at the nose of the tool because the temperature where the thermo-couple is will be higher than at the nose of the tool, depending somewhat upon the size of the opening through which the tool is introduced into the furnace. In order to reduce the radiation loss to a minimum and obtain a satisfactory temperature for the nose of the tool, it has been found advisable to close with bricks the opening into the furnace so that it is just large enough to admit the tool.

After the tools are removed from the high-heat furnace they may be cooled either by directing a heavy blast of compressed air on the nose or dipping the nose into oil. The oil should be cooled and agitated by some means such

Table I.—Chemical Specifications for Tungsten Tool Steel

	Per cent limit	
	Maximum.	Minimum.
Carbon	0.75	0.55
Chromium	5.00	2.50
Manganese	0.30	0.05
Phosphorus	0.015	0.00
Silicon	0.30	0.00
Sulphur	0.02	0.00
Tungsten	20.00	16.00
Vanadium	1.50	0.35
Iron		

*Remainder

as compressed air. The oil was used for these tests and is considered preferable because it is less noisy and expensive than compressed air. Tests which have been made indicate that better results are obtained by oil cooling. The tools are cooled in the oil until they are black hot, when they are removed and placed on a cooling table.

Testing Tools on Nickel Steel Forging

After the heat treatment the tools are ground to the No. 30 Sellers system of lathe tool forms and later tested on a nickel steel forging. All tools of a selective test are tested on one forging because it has been impossible to obtain nickel steel forgings of identical characteristics chemically and physically. The depth of cut, feed and cutting speed are constant throughout a selective test so that the quantity to be determined is the elapsed time of run, or cutting life of the tools. All tools are tested to destruction, after which they are reground and retested until each tool has been tested three times. No lubricant was used on the tool during the test.

The action of the tools when cutting is very interesting, indicating that the material is torn from the forging instead of being cut. The chip wears at first a depression in the face of the tool back of the cutting edge, and the heat generated by the friction of the chip softens the tool. The generation of heat and wearing away of the tool continue until the depression, increasing in size, finally reaches the cutting edge, which suddenly breaks down. It is necessary to grind off about 3-32 in. from the top and end of the tools to remove the effects of the heating. A voltmeter and ammeter were installed and later a graphic wattmeter to determine the input to the motor of the lathe. By this means the average watts of the friction and cutting loads, which were found to be nearly constant, were determined, the difference between the net watts which, multi-

plied by the elapsed time of run of the tool in minutes, gave the work done by the nose of the tool measured by the resistance the forging offers to it. The elapsed time of run for a tool depends somewhat upon the dissipation of heat generated by the friction of the chip, and it has been noted that the steel forging on which the tools are cutting will heat up considerably if it is of small diameter and operated at a high cutting speed. The elapsed time of run decreases as the temperature of the forging which the tool is cutting increases.

Each sample of carbon steel submitted for selective test was tested to determine the recalcrescent point. All tools were heated to a temperature slightly above the recalcrescent point and quenched in brine, after which the temper was drawn in a lead bath. The cutting tools were then ground and were ready for the selective test.

The Milling Cutters Used for Carbon Tool Steel Tests

The proportions of the milling cutter used for the test for carbon tool steel were adapted from a paper by A. L. DeLeeuw in the Transactions of the American Society of Mechanical Engineers. The principal difference from milling cutters in general use is in the comparatively small number of teeth permitting a larger clearance for the chips. This cutter is so small that it was necessary to support the outer end to enable it to stand the heavy cut desired to give a breakdown test similar in purpose to that developed for tungsten tool steel. The cutter was operated at the speed of 370 r.p.m., feed 20 in. per min. and 0.08 in. depth of cut through the full table travel of the milling machine. The table was run back to the starting point and reset as often as necessary until the cutter failed. The cutter was run without lubricant in order to make the test as severe as possible. There was a generation of heat similar to that developed by the tungsten tool steel test which would draw the temper of the cutter, causing the cutting edge to break down. Sometimes the dulling of the cutting edge would increase the torsional stress until finally the physical strength of the cutter would be exceeded and cause it to break in the shank. Tungsten apparently gives to tool steel the property of resisting heat breakdown.

The observations of the carbon tool steels do not agree so closely as those for tungsten tool steel, and the causes for the variations are not very easily determined. In the case of the milling cutters the cutting life is considerably reduced if there is very much vibration, and in order to overcome this as much as possible a heavy, rigidly constructed milling machine was used. If the cutters were not exactly central in the arbor so that they did not rotate around their geometrical axis, vibrations would be set up which would increase in violence until the cutter finally broke down, and it was therefore necessary to very carefully fit the cutters into the arbor.

Experiences with the Tungsten Steels

The treating temperature for the tungsten tool steel can be varied through a short range in the vicinity of 2250 deg. F., without producing much variation in the results of the physical test. The treating temperature of the carbon tool steels seems to be within narrower limits, which may perhaps account for some of the variations in the test. It is, of course, extremely difficult to hold the furnaces, which are of the oil-burning type, to absolutely definite temperatures.

The test of the carbon tool steel which contained tungsten showed less vibration than the carbon tool steels without tungsten. This may indicate that the addition of tungsten increases the treating temperature limits slightly without affecting the results of the physical test very much.

Table II.—Chemical Specifications for Carbon Tool Steel.

	Class 1. per cent. limit.		Class 2. per cent. limit.		Class 3. per cent. limit.		Class 4. per cent. limit.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
Carbon	1.25	1.15	1.15	1.05	0.95	0.85	0.85	0.75
Chromium	†	†	†	†	†	†	†	†
Manganese	0.35	0.15	0.35	0.15	0.35	0.15	0.35	0.15
Phosphorus	0.015	0.00	0.015	0.00	0.02	0.00	0.02	0.00
Silicon	0.40	0.10	0.40	0.10	0.40	0.10	0.40	0.10
Sulphur	0.02	0.00	0.02	0.00	0.02	0.00	0.025	0.00
Vanadium	†	†	†	†	†	†	†	†
Iron	†	†	†	†	†	†	†	†

*Remainder.

†Optional.

The addition of tungsten seems to produce two desirable results: The increasing of the cutting life of the tools and

increasing the treating temperature limits of the tool steels. The tool steel containing this element apparently does not require any different method of treating from that in general use for carbon tool steels.

Classifications of the Tool Steels

Tungsten Tool Steel.—Lathe and planer tools, milling machine tools, and, in general, all tools for which high-speed steel is used. The chemical specifications for tungsten tool steel are given in Table I.

Class 1.—Lathe and planer tools and tools requiring a keen cutting edge combined with great hardness, for finishing shrinkage dimensions on nickel steel gun forgings, drills, taps, reamers and screw-cutting dies.

Class 2.—Milling cutters, mandrels, trimmer dies, threading dies and general machine shop tools requiring a keen cutting edge combined with hardness.

Class 3.—Pneumatic chisels, punches, shear blades, etc., and in general tools requiring a hard surface with considerable tenacity.

Class 4.—Rivet sets, hammers, cupping tools, smith tools, hot drop forge dies, etc., and, in general, tools which require great toughness combined with the necessary hardness. The chemical specifications for carbon tool steel are contained in Table II.

Geared Turbines for Ship Propulsion

Improvement in Gear Cutting, by Securing Greater Accuracy, Reduces Noise

In a paper on "Mechanical Gearing for the Propulsion of Ships," recently read before the Institution of Naval Architects, London, Sir Charles Parsons referred to the progress which has been made with geared turbines and described an improved method of cutting the gear teeth. He mentioned that there were already in actual service cargo steamers, passenger steamers, and warships, together representing a total of about 26,000 hp. developed by steam turbines and transmitted through mechanical gearing, and that turbine machinery with mechanical gearing representing a transmission of over 120,000 hp., including two installations of over 20,000 hp. each, was at present under construction.

A coal-consumption trial had been made with the Cairnross, a cargo vessel having geared turbines, running side by side with a sister-ship, the Cairngowan, with exactly similar boilers and propeller, but with triple-expansion reciprocating engines, the coal supplied being of the same quality and measured in the same way on both ships, and the geared turbine ship had shown a saving of 15 per cent. in the coal consumption.

So far no limit in regard to the surface speed of the teeth had been discerned, and there was no evidence of any limit to the power that could be transmitted by mechanical gearing with gear wheels suitably designed. Examination of the teeth of gear wheels which had been running for some little time, transmitting large powers, showed the work to be distributed over the teeth with fair uniformity.

Investigation of Causes of Noise

Careful investigations made of the causes producing noise, with the object of removing such causes and obtaining a silent gear, showed the noise to be due to slight inaccuracies in the teeth, the order of accuracy required for silent gearing being higher than present gear-cutting machines were capable of affording. From a microphone oscillograph record obtained from a double helical gear wheel, by suspending over the gear case a microphone connected with an oscillograph, it was observed that definite notes were produced. In one particular case the frequency was 160 times the number of revolutions of the wheel, and its source was traced to the parent gear of the gear-cutting machine, namely, the single worm and the 160 teeth of the worm wheel which rotated the table on which the work was mounted while the wheel was being cut.

The inaccuracies of this gear were carefully measured and found to be co-periodic with the worm-wheel teeth, and to have a double amplitude of about four-thousandths of an inch. As there did not appear at the time to be any means of removing the irregularities from the teeth, and

very silent running was desired in this instance, stiff springs were fitted above and below the bearings, having a small amount of initial compression and permitting a movement of about one-hundredth of an inch as the load was increased to its full value. The pinions being thus flexibly supported, noise and shock were to some considerable extent intercepted instead of being transmitted to the structure of the gear case.

Improved Means of Gear Cutting Devised

It was recognized, however, that spring supports were an imperfect remedy, the real remedy being a higher degree of accuracy in the teeth. To attain this it was necessary either to increase greatly the accuracy of the parent gear or to devise means of cutting which did not reproduce the errors of the parent gear, and, what was still more important, avoided periodicity in the residual errors.

An improved method of cutting gear-wheel teeth developed by the author and his colleagues aimed primarily at destroying the periodicity of the errors, but incidentally it also accomplished a considerable reduction of the errors themselves present in the parent gear.

In the process ordinarily adopted, in which the work was mounted on a table rotated by means of a worm and worm wheel, the latter being attached permanently to the table, the errors were some function of the angular position of the work, and, therefore, lay in planes through the axis of rotation; and if, as was mostly the case, the errors of the parent gear were periodic, these planes would lie at equal angular intervals, and would come into mesh periodically. But if the work was given a small steady advance in relation to the table, the errors, instead of lying in planes through the axis, would lie in spirals around the wheel, and when put to work they would be obliterated and leave a true wheel.

In adapting this new principle of cutting to an existing gear-hobbing machine, a secondary table was mounted on the original table of the machine and given a creep in advance of 1 per cent. in relation to it by means of a train of gearing, the main worm driving the lower table being driven at 1 per cent. less speed, so as to secure the same rotational speed as before the creep was introduced.

While the most important effect of this arrangement was that the errors in the teeth would lie in very oblique spirals around the wheel, resulting in great uniformity in the gearing, at the same time it had also an important effect in reducing the errors themselves. If the periodic error in the worm gear of the original table were represented by a sine curve with a period corresponding to the teeth of the worm wheel, that was 160 per revolution, an advance of 1 per cent. resulted in the phase of the error being shifted 1.616 of a complete pitch at each revolution of the work. With the cutter advancing across the wheel, the result was a series of overlapping cuts of varying depth, the maximum depth being, say, about four-thousandths of an inch below the minimum. In this way three things had been accomplished: (1) The errors had been reduced to about one-fifth of their original magnitude. (2) They were spread across the wheel in such a way that periodicity was avoided. (3) They consisted of cuspidal ridges which would be easily reduced by grinding or wear and leave a practically true wheel.

Discussion

In the course of the discussion Sir Charles Parsons said that a gear cut by the new method had just been tried for driving a mill in a Scottish works, and the difference between its behavior and that of the one formerly employed was very marked. With further adjustment in the gear-cutting machine he believed that gears could be cut which would be almost absolutely silent. Up to the present time the largest power transmitted on a single pinion was 3000 hp. and that gear, which had been in service for some time, showed no sign of wear. He believed that gears up to 6000 hp. on one pinion could be successfully cut.

Directors of the La Belle Iron Works, at a meeting held at Steubenville, Ohio, elected the following officers: George Grier, chairman of the board; W. D. Crawford, president; H. D. Westfall, vice-president; R. C. Kirk, secretary-treasurer; B. A. Burt, assistant treasurer and auditor, succeeding J. C. Gilmore, who recently resigned; G. B. Levan, general manager.

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A Career That Marks a Transition

While the greatest of his achievements in the concentration of resources was the formation of the United States Steel Corporation, Mr. Morgan's personality was never outstanding in the steel industry itself. The working out of its problems in the past twelve years, some of which were due to this very masterstroke of his career, has fallen to others. When in the early days of the Steel Corporation an issue was made by organized labor in certain mills, in a way calculated to compel concession, since security values were at stake, Mr. Morgan personally took up the gauge and squarely met the question of control. Six or seven years after, when the steel manufacturers were threading their way through the dangers of the 1907 panic and the later months of depression, he made his first appearance in any gathering fully representative of the industry and indicated how all business waited on the conserving action of the leaders in iron and steel.

As to the extent of his power in the Steel Corporation, his chief associate in it who himself led the co-operative movement in that trying time, has given formal testimony. When inquired of concerning the reported domination of its affairs by one man he replied that while Mr. Morgan did not control the Corporation there were certain matters about which his associates thought he ought to be consulted. That answer is probably as fully expressive as Mr. Morgan's own reply to the investigator who asked why he bought control of an important insurance company—"for the very reason that I thought it was the thing to do."

Mr. Morgan's preëminence in American finance is uncontested. The constructive character of his work and the high service he has rendered have been emphasized again and again. But after the Steel Corporation, this climax of the movement to do away with destructive competition, the developments of the past two years have put a large mark of interrogation. Here some of the highest powers in the nation are engaged in the effort to undo what he did. And the question may well be asked, wherein is this to be classed as something apart from all his other work that has been so generally called beneficent and admirable. Nothing better measures the rapid drift to a new condition than that in twelve years from the ushering in of a regime of the highest concentration in industry, the country is in the midst of a determined effort to restore the "old time competition," with the alternative of government regulation that is a long step toward socialism. Mr. Morgan's career ends with the assertion of a pronounced sentiment against the individual acquirement of such power as he used so splendidly for the material upbuilding of the country. Yet the proponents of the new order might well ask for another Morgan to direct them in the herculean task to which they are addressing themselves with such amazing confidence.

Autobiography in Industry

Autobiographic writing is not practiced as much as it should be. The history of the development of any branch of industry is not necessarily a record of the doings of one or a few individuals. There should be many contemporary accounts at first hand of everything which has made for progress for any given period. Even in the case of the pioneer in a movement it is desirable to have the personal record, for though the accomplishments of the leader are the subject of

much independent investigation, it is often true that many things are left to conjecture which otherwise would be cleared up if the one responsible had taken the time to set down his own activities and experiences.

It has not been the habit of the engineer nor of the manufacturer to go in for personal biographies. That has more commonly been left to litterateurs, to soldiers and to statesmen. In manufacturing, even in a measure in engineering, thought is focused chiefly on what is yet to be done. Moreover, many who have had a large part in progress have been prone to belittle their share, and their modesty, when not their disinclination, has forbidden utilizing leisure hours in the later years of life in setting things straight.

The successful man should so regulate his affairs that when he is able rightly to reduce the intensity of his labors, he may devote some time to making the indelible record. This need not be spread before the public, either in his lifetime or later, but it would furnish data concerning developments in the industrial arts that are now often secured with great difficulty and not always with full assurance of accuracy. It would have been of no small consequence to the American steel trade had a more detailed record been made by Kelly of his early experiments with the pneumatic process. On the other hand, it is a great satisfaction that the vicissitudes of American steel rail manufacture in its beginnings and the steps which marked the advance of rolling mill practice in this country have been so carefully set down as in the fascinating autobiography of John Fritz.

Our Exports and the Tariff

The revision of the tariff should be done with a view to avoiding the necessity of making changes for a considerable period of years. Trade conditions at the time of making the revision should not be given too great consideration. If revision is undertaken at a time of world-wide depression, when strenuous efforts are being made by foreign manufacturers to reach our markets, duties are likely to be made higher than necessary under normal conditions. On the other hand, if revision takes place at a time of world-wide prosperity, other manufacturing nations are so busily engaged that the competition in our markets is not serious, and duties then can easily be placed too low. We are passing through an experience of the latter character at the present time. For the past two or three years prosperity has been the rule all over the world. The United States was a laggard in getting in step with other nations in the march toward prosperity, but from the spring of last year we have had little to complain of in this respect.

The effect of world-wide prosperity has been seen in our increasing volume of exports. This growth has not simply been in products of the farm, forest or mine, but also in manufactured articles. Great growth has occurred in our exports of highly finished merchandise, even in lines in which a few years ago it had been thought almost impossible to cultivate an export trade. The markets of the world, however, have been taking increasing quantities of all kinds of commodities, and in supplying these wants the resources of the United States have been drawn upon. Our exports of manufactured articles have gone only to a limited extent to Europe, but our outside markets have been found mainly in countries in which manufactures have not been so highly developed. It would be wrong to infer from the tremendous increase in

our export trade of the past two or three years that we have reached a point at which we need no longer fear the invasion of our markets by manufacturers in other countries.

In deciding upon rates, therefore, it is not well for those who are engaged in tariff revision to place too great reliance on conditions such as have recently prevailed. If the rates to be fixed in the approaching tariff revision are to continue in force for several years, they should not be placed so low as immediate conditions would appear to warrant. The other manufacturing nations of the world are giving indications of some slowing down in their activity. Instead of European prices on iron and steel, for instance, ranging at or above prices on corresponding products in this country, we are likely to see in the near future a reduction in European prices and an approach to what we have been in the habit of considering normal conditions. The lower scale of wages in Europe necessarily means lower costs of production and ability to compete with our manufacturers to the disadvantage of the latter. This is a condition which will inevitably have to be faced ere long, and when it comes it will be unfortunate for this country if duties are found to be so low as to permit a serious influx of foreign products.

Early Saloon Hours and the Workman

A movement is on foot in several States to amend the liquor laws so that saloons cannot open for business in the morning until after 7 o'clock. Experience has proved that the effects of alcohol on workmen in the beginning of the day are not only injurious to their general health, but act directly to increase the percentage of accidents.

Various manufacturers have kept careful record of accidents in their works to determine to what extent drinking in the early morning and in the noon hour influences the hazard. In one case the opening of a saloon near the gates of a large plant, where none had previously been permitted, caused the curve of accidents to ascend sharply, especially after the noon hour. The removal of the saloon some time afterward sent the curve downward to its old level. One investigator has demonstrated that following shortly after the opening of works in the morning and afternoon comes the period of inevitable reaction for those who have taken liquor, the accident rate being then abnormally high.

The percentage of employees who take liquor at the breakfast period of the day is probably low, especially among skilled labor. However, in certain sections the habit prevails to a regrettable degree, and everywhere to some extent. In certain cases it is due to racial customs. Physicians warmly approve the restriction proposed because of the well known fact that the alcohol habit is better controlled where early morning drinking is restrained. Every manufacturer knows the influence of the saloon on his men, including some of his best artisans, and considers the elimination of the evil in any way a forward step. The trouble with the proposed early morning closing is that it has been coupled with other changes so radical as to make successful legislation quite improbable. The question should be threshed out alone, and not with that of earlier closing at night and other aspects of the law.

Undoubtedly the large majority of shop workmen would approve the change were the facts properly put before them. The noon hour is another matter. Prob-

ably it would be difficult to secure a ban on liquor selling in the middle of the day, though the greatest damage is undoubtedly done then because of the far greater number of men indulging themselves at that time.

An Improved Trade School Course

The State Trade School at Bridgeport, Conn., has made an important innovation by giving its students in the regular mechanical course the right to enter the shops of the city as apprentices for one year, at the third year rate of apprentice wages, with a diploma as graduate journeymen as the final reward.

The school has two mechanical courses, that of the regular trade school, covering two years, and the half-time course of three years. The final apprenticeship year combines in the regular course the advantages of both. The half-time boys divide their day between the class room and the shops of the city. The other students do their practical work in the school's excellent shops.

A lad gets a sound training in the basic studies, including mathematics as the principal feature, and a very practical course in the shop and drafting room. At the end of two years he has acquired a good foundation of knowledge in which theory and practice are wisely commingled. However, he has not had the same influence of real industrial environment as the boys of the half-time school, much of whose effort has been in an atmosphere of high tension production. The third year as an apprentice supplies a most essential element of training. The two years' course stands the lad in good stead.

It has been found by the manufacturers in whose works these post-graduate courses are pursued that the trade school boy is at a real advantage over his regular apprentice associates of the third year. He has a better knowledge of the scientific principles involved in the work and its preparation; of costs of materials and labor; of the reading of drawings, etc. The manufacturers of Bridgeport got together before the supplementary year was decided upon and agreed to the plan in its relation to their works. It has been demonstrated that a large percentage of these boys stick to the plants where their diplomas were granted.

Tariff Revision Prospects

WASHINGTON, April 1.—Democratic leaders of House and Senate are planning to put through a revision of the tariff in record breaking time, and as a result, unless strong pressure is brought, the Senate Finance Committee will give no hearings on the subject. It is, however, the intention of the committee under any circumstances to take up the tariff and follow it as it is considered in the House.

The Democratic or majority members of the Ways and Means Committee have completed the revision of the schedules and the indications now are that the revision will take place in a single bill. Senator Simmons, chairman of the Finance Committee, favors a single bill, and if the House sends separate bills to the Senate revising individual schedules, they will all be considered together in conference. However, the revision measure or measures will be submitted to a Democratic caucus to be held early next week, the extra session convening Monday, April 7, and the caucus will decide the matter so far as the House is concerned. Senator Simmons seems confident that the Senate Democrats can get together on the tariff, and that there will be no undue delay. In this connection he says:

"While there may be differences of opinion over some of the schedules among Democratic Senators, I believe we are well lined up on most of the tariff matters. With our present majority of six in the Senate, we should be able to pass the schedules according to Democratic ideas. I believe, too, that in many instances we will have some of the progressive Republicans voting with us, as they did during

the last Congress. If representatives of some of the industries believe that they have not had all the hearings that is just to them, we may agree to hear them."

President Wilson has completed his message to the extraordinary session and it leaves the way open for legislation of all kinds. It is believed that legislation outside of the tariff on such subjects as banking and currency, amendment of the Sherman act, etc., depends upon "the smoothness with which the tariff revision plans move," to use an expression of a Democratic House leader. W. L. C.

Book Reviews

Adolf Ledebur: His Life, Character and Work. ("Adolf Ledebur, der Eisenhüttenmann, Sein Leben, Wesen und Seine Werke"). By Dr. Engelbert Leber. Pages, 166, 6 x 8 1/4 in.; 6 full-page illustrations. Published by Verlag Stahleisen m.b.H., Düsseldorf. Price, 5 marks.

This biography of the well-known German metallurgist, investigator and teacher, who died June 7, 1906, is written by one of his old students, now docent in the University of Breslau. A brief outline of his life is first given. He was born January 11, 1837, at Blankenburg in the Harz, and attended the gymnasium at that place from 1848 to 1854. After private study and practical work at the Zorge iron plant he passed the state service examination in 1855. His technical high school studies were over in 1858, and in 1862, after four more years' practical experience, he passed his final oral examinations. The succeeding thirteen years were spent in practice, not in the state service, but on his own account. On December 1, 1874, he was called to the newly founded chair of iron and steel metallurgy at Freiburg, where he started on his duties March 31, 1875, being then in his 38th year, and having had 20 years of practical experience. He remained at Freiberg until his death at the age of 69, his work in teaching, research and the writing of books and papers contributing causes that has built up the reputation of the Freiberg School of Mines.

The author next devotes many pages to the personality of the "old master," as he was affectionately and with all respect known among his students. He clearly brings out that his seriousness, calmness and self-composure did not make him inaccessible, but that his high sense of duty and the absolute truth and earnestness of his character exerted a great influence on the men who studied under him. Ledebur, the investigator, is considered in the succeeding chapter, with his methods of thought and work.

Next come chapters dealing in detail with the subjects Ledebur worked on, the results he obtained, and his publications. A list of the latter is given in an appendix. There were 155 separate articles, and 13 books appeared in many editions. As is well known, the subjects treated cover almost the whole range of iron and steel metallurgy, and Ledebur's writings have exerted a tremendous educational influence in Germany and other countries. So far as is possible with such technical matters, he treated them in a way that will certainly appeal to even non-technical readers. The final chapter reviews the lessons of his life, taking up the reasons for its great success. This gives an opportunity for a thoughtful discussion of the question of technical education, especially as applied to iron and steel metallurgists, and the interesting views of Ledebur on this important subject are fully given.

The book has been very well received by the German press. It is both sympathetic and authoritative, and as one German reviewer has very properly said, "it is to be wished that we had more books of this kind." G. B. W.

Year Book of the American Iron and Steel Institute, 1912. Compiled by James T. McCleary, secretary. Cloth; 6 x 9 1/4 in.; pages, 271.

In his foreword to this first Year Book of the American Iron and Steel Institute, Secretary McCleary says that while the immediate publication of the proceedings of each of the semi-annual meetings of the Institute is made through the iron and steel trade press, the official publication will be made each year in this permanent form. In the present volume all the papers read at the May meeting in New York and the October meeting at Pittsburgh are given in full, together with discussions. The latter are rather meager, but it may be assumed that as the Institute develops, copies of the papers will be distributed in advance of the meetings and an effort will be made to encourage discussion of them.

Ferromanganese Freight Rates

Freight rates involving changes in differentials for ferromanganese for shipment west from Philadelphia and Baltimore continue of interest. It is now announced that the differential of 20c. per ton between the Baltimore and Philadelphia rates will be reduced after April 11 to 10c. In other words, a new rate of \$2 from Baltimore to Pittsburgh becomes effective on that date, while \$2.10 will be the rate between Philadelphia and Pittsburgh. The present rate from Philadelphia to Pittsburgh is \$2.50. These readjustments became necessary because of the new rate announced by the Western Maryland Railroad, which has about completed a new pier at Baltimore. Philadelphia and Baltimore have been strong competitors in the ferroalloy freight traffic, as is shown by the following data, just compiled, showing importations of ferromanganese during the last three months of 1912: Importations at Baltimore, 13,140 tons; at Philadelphia, 12,133 tons; New Orleans, 5,131 tons; other ports, 889 tons; total, 31,293 tons. A considerable share of the business is expected to continue to come by the way of Philadelphia, as the slight increase in freight to the West is expected to be absorbed by some of the steamship companies, in view of the heavy return freight for export.

Important Ore Transaction

While still lacking in details, the transaction involving a purchase of 500,000 tons of Imataca iron ore, for delivery in instalments of 100,000 tons a year, by the Alan Wood Iron & Steel Company, Philadelphia, Pa., operating blast furnaces at Swedeland, Pa., and steel mills at Ivy Rock and Conshohocken, Pa., is of interest. The sale was made by the Canadian Venezuelan Ore Company, Ltd., Montreal, Canada, for which Naylor & Co., New York and Philadelphia, are agents. The ore deposit, which lies on the Orinoco River in Venezuela, was described at length in *The Iron Age* some time ago and has been under development for several years. In 1912 some 12,000 tons of this ore was imported and tested at several eastern Pennsylvania furnaces. The ore is of Bessemer grade and has a metallic iron content of 60 to 65 per cent. Shipments on the contract are to be started at once and it is planned to import the ore in cargoes of 5000 tons. Importations heretofore have been on a smaller scale.

Production of Lead in 1912

The production of primary refined lead in the United States in 1912, as reported by C. E. Siebenthal of the United States Geological Survey, was 480,894 net tons, against 486,979 tons in 1911, being a decrease of 6085 tons. The quantity of secondary lead—obtained by refining skimmings, drosses, old metals, etc.—was 63,350 net tons in 1912, against 54,284 tons in 1911. The quantity of primary lead smelted from domestic ore in 1912 was 415,322 net tons, while the quantity smelted or refined from foreign ore or foreign base bullion was 88,377 tons. The world's production of lead for 1911 is stated at 1,214,069 tons, against 1,225,967 tons in 1910. Of the 1911 production the percentage of the United States is placed at 33.4. The world's figures for 1912 are not yet available.

Machinery Hall, a new building at the corner of Washington boulevard and North Clinton street, Chicago, is practically completed and during the past month has become the new location of the following companies associated with the machinery trade: E. L. Essley Machinery Company, now at 815-817 Washington boulevard; Wiley & Russell Mfg. Company, now at 550 Washington boulevard; Goodell-Pratt Company, now at 550 Washington boulevard; Sterling Grinding Wheel Company and Surple, Dunn & Co., now at 152 West Lake street.

Wage adjustments, effective March 1, at several of the steel works at Coatesville, Pa., materially affected payments last week, when advances ranging from 5 to 15 per cent. were paid by the Lukens Iron & Steel Company. Efforts of the principal mills in Coatesville have been to get wages on a comparatively uniform basis, and readjustments have been made from time to time with this object in view.

French Foundrymen's Convention

The Association Technique de Fonderie will hold a convention and an exhibition of foundry appliances at the Ecole Nationale d'Arts et Metiers, 151 Boulevard de l'Hopital, Paris, France, from May 26 to 31 inclusive. The programme, forwarded by E. Ronceray, states that the registration will be made May 26 and on that day the secretary will receive visitors, distribute badges and furnish information regarding the convention and the exhibition. On the day following, Tuesday, the convention will be formally opened and a discussion will take place on the results of a competition on the practical study of foundry cupolas. Sessions will be held in the morning and afternoon of that day when various papers will be presented relating to iron foundry practice and discussions will follow.

On Wednesday a business session will be held in the morning, at which papers will be read on features of iron, malleable and steel foundries. On Thursday morning and afternoon sessions will be held, which will be devoted to the reading and discussion of papers on copper, aluminum and other non-ferrous metals. A discussion will also take place on the results of competition on the study of phenomena occurring in the molds in casting such metals. In the evening of this day a banquet will be held at the Palais d'Orsay. Friday and Saturday will be given up to the exhibition and visits to local foundries.

Papers have been prepared thus far on new testing methods in the copper foundry; oxidizing agents in the copper foundry and their use; thermal treatments in the foundry and their use; American foundries and factories; oil heating of metallurgical furnaces; numerical and chemical classification of castings; cast iron in the light of recent researches; researches on zinc and aluminum alloys.

Iron and Steel Institute Members

The following are the latest additions to the membership of the American Iron and Steel Institute, as reported by Secretary James T. McCleary, 30 Church street, New York:

Frank A. Burr, Birmingham, Ala., general sales manager Tennessee Coal, Iron & Railroad Company.
Waddill Catchings, 90 West street, New York City, president Central Foundry Company.
John M. Davidson, Pittsburgh, civil engineer American Sheet & Tin Plate Company.
Richard C. Drinker, Quincy, Mass., metallurgical engineer Fore River Shipbuilding Company.
John C. Jay, Jr., Philadelphia, general manager of sales Pennsylvania Steel Company.
Frank H. Johnson, Pittsburgh, assistant general manager West Leechburg Steel Company.
William A. Leonard, West Wareham, Mass., treasurer and manager Tremont Nail Company.
William W. Lukens, Philadelphia, secretary and assistant treasurer Alan Wood Iron & Steel Company.
Stewart McC. Marshall, Johnstown, Pa., chief engineer Cambria Steel Company.
William H. Pratt, Chicago, president Illinois Steel Warehouse Company.
Frank Tenney, Philadelphia, assistant to president Pennsylvania Steel Company.

Motor Truck Experience of a Railroad Car Builder.

A motor truck experience of the American Car & Foundry Company at Chicago has recently been studied by R. W. Hutchinson, Jr., of the International Motor Company, New York. In a year's operation a 6½-ton Saurer truck transported 14.1 tons a day a distance of 33 miles at an average cost of \$6.45 per day, or a cost of 45.8 cents per net ton. Adding to the per ton cost interest on the investment at 6 per cent. and all necessary motor vehicle insurance and an annual overhauling fund of \$450, increased the fixed charges per ton by 32.2 cents, bringing the total cost per ton transported to 78 cents. With rented horse equipment the former cost of the American Car & Foundry Company was \$2 to \$2.50 per ton, the truck thus saving about \$400 per month and representing a return on the investment of 98 per cent., or sufficient to pay for the truck in one year's service.

James J. Hart, 131 State street, Boston, Mass., has been appointed New England representative for the Pennsylvania Pneumatic Company, Erie, Pa., in the sale of the Barr unit-compound air compressors.

The Iron and Metal Markets

Works Resuming Rapidly

Steel Loss 250,000 to 300,000 Tons

Railroad Bridge Requirements Large—Agricultural Buying of Bars

Resumptions at the flooded iron and steel plants in Ohio, western Pennsylvania and West Virginia have come sooner than was predicted, and early estimates of the cutting off of production can be considerably reduced. While there has been much exaggeration as to property damage and shut downs, the facts are serious enough. Steel producers have had a severe set back while they were under strain to meet their obligations to consumers.

But for the flood March would have been a record month in output of pig iron and steel. The pig-iron statistics are not yet available, but they promise to exceed the total for the 28 days of February. First and last the loss in blast furnace output may be 250,000 tons or more. Much depends on the ability of the railroads to furnish a normal supply of coke. Furnaces not flood bound have had to bank, because in their crippled condition the railroads could not get sufficient fuel to them.

As many as 55 furnaces were banked when the floods were at their worst. About 40 of these are now in blast and probably 10 more will be going by the end of the week. One furnace at Sharon and one at Columbus were chilled and will be out for some time.

Steel works output was reduced more than that of blast furnaces, and a good many finishing mills, particularly sheet and tin plate works, have suffered in consequence. Jobbers' stocks have had to do duty steadily for months and have not been rebuilt so that they could respond to the new demand thrown upon them. The result is embarrassment to many manufacturing consumers.

The same flood that has or will yet cause a loss of 250,000 to 300,000 tons in steel output, brings down upon the mills emergency calls that will only add to the difficulties in deliveries. One railroad system will need 100 bridges, large and small. In addition to structural steel and bars, some railroads are placing new orders for rails.

Property loss to iron and steel works by the floods is not yet heavy when compared with the loss of business. At Sharon, Pa., and Youngstown, Ohio, a number of open-hearth furnaces which were hot when the water reached them are seriously damaged. A heavy loss, which will be accumulating for many days, is in the dislocation of railroad operations over a wide area.

The market effects of the flood will require time for their full development. The steel companies will not need more pig iron because of it, since their steel output is reduced more than that of their blast furnaces. The closing of coke ovens, due to the inability of railroads to make full coke shipments, may still limit pig-iron output in some districts, counteracting some of the weakness generally evident in that product. So far as foundry iron is concerned, the flood has apparently cut down output more than it has reduced the consumption.

If the week has been disastrous for many producers of iron and steel it has also greatly restricted business. Apart from what the railroads are already figuring on,

the largest new buying is in bars. Some implement business has been closed, but the mills limited deliveries to six months from July 1 rather than a year. One Pittsburgh interest closed about 100,000 tons. In rails the chief business reported is 24,000 tons taken by the Ensley mill.

Tin plate and sheet mills of the Steel Corporation are running to about 55 per cent. of capacity this week, as against only 40 per cent. at one time last week.

Pig-iron markets in the Central West have been practically at a standstill for a week. At Chicago the possibility of some local merchant furnaces banking for lack of coke has brought out some inquiry from malleable foundries for charcoal iron. In the East a few sales of foundry iron have developed some weak spots. Southern forge at \$12 and No. 3 at \$12.25, Birmingham, are the reported basis of pipe foundry purchases. In the Central West No. 2 foundry iron has shaded off to \$16 at furnace.

Eastern Pennsylvania furnaces have sold about 10,000 tons of basic iron to one steel company at \$17 delivered. For Canton, Ohio, a sale of 6000 tons of basic is reported at slightly under \$16 Valley furnace. At Buffalo a sale of about 8000 tons was made to a nearby steel plant. Bessemer iron has settled to \$17 at Valley furnace.

Foreign sellers of ferromanganese have found that market rather top-heavy and prices have been cut by one interest this week to \$61, Baltimore.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	April 2,	Mar. 26,	Mar. 5,	April 3,
Pig Iron, Per Gross Ton:	1913.	1913.	1913.	1912.
Foundry No. 2 X, Philadelphia.	\$17.75	\$17.75	\$17.80	\$15.00
Foundry No. 2, Valley furnace.	16.00	16.25	17.00	13.25
Foundry No. 2 S'th'n, Cin'ti.	16.25	16.25	16.50	13.75
Foundry No. 2, Birmingham, Ala.	13.00	13.00	13.25	10.50
Foundry No. 2, furnace, Chicago*	17.25	17.25	17.25	14.25
Basic, delivered, eastern Pa.	17.00	17.50	18.00	14.50
Basic, Valley furnace	16.00	16.00	16.25	13.00
Bessemer, Pittsburgh	17.90	18.15	18.15	15.15
Malleable Bessemer, Chicago*	17.25	17.25	17.25	14.00
Gray forge, Pittsburgh	16.75	16.75	17.15	13.65
Lake Superior charcoal, Chicago	18.00	18.00	18.00	15.75

Billets, etc. Per Gross Ton:	28.50	28.50	28.50	20.00
Bessemer billets, Pittsburgh...	29.00	29.00	29.00	20.00
Open-hearth billets, Pittsburgh	36.00	36.00	36.00	26.50
Open-hearth billets, Philadelphia	30.00	30.00	32.00	22.40
Wire rods, Pittsburgh	30.00	30.00	30.00	25.00

Old Material, Per Gross Ton:	16.25	16.25	16.25	15.25
Iron rails, Chicago	18.00	18.00	18.00	15.50
Carwheels, Chicago	16.75	16.75	16.75	13.00
Carwheels, Philadelphia	15.00	15.00	15.00	12.50
Heavy steel scrap, Pittsburgh	14.25	14.25	14.00	13.00
Heavy steel scrap, Chicago	12.50	12.25	12.00	11.00
Heavy steel scrap, Philadelphia	13.75	13.50	12.50	12.50

Finished Iron and Steel,				
Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill...	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	1.67½	1.67½	1.67½	1.25
Iron bars, Pittsburgh	1.70	1.70	1.70	1.25
Iron bars, Chicago	1.57½	1.57½	1.57½	1.15
Steel bars, Pittsburgh, future	1.40	1.40	1.40	1.15
Steel bars, Pittsburgh, prompt	1.85	1.85	1.85	1.15
Steel bars, New York, future	1.56	1.56	1.56	1.31
Steel bars, New York, prompt	2.01	2.01	2.01	1.31
Tank plates, Pittsburgh, future	1.45	1.45	1.45	1.20
Tank plates, Pittsburgh, prompt	1.70	1.70	1.70	1.20
Tank plates, New York, future	1.61	1.61	1.61	1.31
Tank plates, New York, prompt	1.76	1.76	1.76	1.31
Beams, Pittsburgh, future	1.45	1.45	1.45	1.20
Beams, Pittsburgh, prompt	1.70	1.70	1.70	1.20
Beams, New York, future	1.61	1.61	1.61	1.31
Beams, New York, prompt	1.76	1.76	1.86	1.31
Angles, Pittsburgh, future	1.45	1.45	1.45	1.20
Angles, Pittsburgh, prompt	1.70	1.70	1.70	1.20
Angles, New York, future	1.61	1.61	1.61	1.31
Angles, New York, prompt	1.76	1.76	1.86	1.31
Skelp, grooved steel, Pittsburgh	1.45	1.45	1.45	1.10
Skelp, sheared steel, Pittsburgh	1.50	1.50	1.50	1.15
Steel hoops, Pittsburgh	1.60	1.60	1.60	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,

	April 2, 1913.	Mar. 26, 1913.	Mar. 5, 1913.	April 3, 1913.
Per Pound to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	2.35	2.35	2.35	1.85
Wire nails, Pittsburgh	1.80	1.80	1.75	1.60
Cut nails, f.o.b. Eastern mills	1.80	1.80	1.80	1.55
Cut nails, Pittsburgh	1.70	1.70	1.70	1.55
Fence wire, ann'd, 0 to 9, Pgh.	1.60	1.60	1.55	1.40
Barb wire, galv., Pittsburgh	2.20	2.20	2.15	1.90

Coke, Connellsville, Per Net Ton, at Oven:

Furnace coke, prompt shipment	\$2.25	\$2.30	\$2.50	\$2.10
Furnace coke, future delivery	2.25	2.50	2.50	2.15
Foundry coke, prompt shipment	3.00	3.00	3.00	2.50
Foundry coke, future delivery	3.00	3.00	3.00	2.50

Metals, Per Pound to Large Buyers:

Lake copper, New York	15.37½	15.00	15.00	16.00
Electrolytic copper, New York	15.12½	14.87½	14.87½	16.00
Spelter, St. Louis	5.75	6.05	6.20	6.60
Spelter, New York	5.90	6.20	6.35	6.75
Lead, St. Louis	4.20	4.20	4.20	4.12½
Lead, New York	4.35	4.35	4.35	4.20
Tin, New York	48.00	46.75	48.50	43.00
Antimony, Hallett, New York	8.50	8.50	8.62½	7.75
Tin plate, 100-lb. box, Pittsburgh	\$3.60	\$3.60	\$3.60	\$3.30

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.45c. to 1.70c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft., down to the weight of 3-16 in., take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.**Cents per lb.**

Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No. 2.	.15
Gauges under No. 8 to and including No. 9.	.25
Gauges under No. 9 to and including No. 10.	.30
Gauges under No. 10 to and including No. 12.	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over.	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive.	.05
Widths over 110 in. up to 115 in., inclusive.	.10
Widths over 115 in. up to 120 in., inclusive.	.15
Widths over 120 in. up to 125 in., inclusive.	.25
Widths over 125 in. up to 130 in., inclusive.	.50
Widths over 130 in.	1.00
Cutting to lengths, under 3 ft., to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and tees, 3 in. and over, 1.45c. to 1.70c. extras on other shapes and sizes are as follows:

I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs.	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, hand rail, car-truck and conductor rail)	.05
Angles, channels and tees, under 3 in. wide as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft., to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting for cutting to lengths 2 ft. and over.	

Wire Rods and Wire.—Bessemer, open-hearth and chain rods, \$30. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, \$1.60; galvanized, \$2. Galvanized barb wire, to jobbers, \$2.20; painted, \$1.80. Wire nails, to jobbers, \$1.80.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

		Plain Wire, per 100 lb.							
Nos.	0 to 9	10	11	12 & 12½	13	14	15	16	
Annealed	\$1.75	\$1.80	\$1.85	\$1.90	\$2.00	\$2.10	\$2.20	\$2.30	
Galvanized	2.15	2.20	2.25	2.30	2.40	2.50	2.90	3.00	

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe (full weight) in effect from January 1, 1913, iron pipe (full weight), from October 21, 1912:

		Steel.			Iron.		
Inches.		Black.	Galv.		Black.	Galv.	
⅝, ¾ and ⅞	73	52½	54	⅝ and ¾	67	48	
1	77	66½	68	¾	66	47	
¾ to 3	80	71½	72	¾ to 2½	70	57	
2	77	68½	69	1½	57	46	
2½ to 6	79	70½	71	1½	68	57	
7 to 12	76	65½	66	2	69	59	
13 to 15	53	..	..	2½ to 4	71	62	
				4½ to 6	71	62	
				7 to 12	69	56	

Plugged and Reamed.

1 to 3, butt.	78	69½	1 to 1½, butt.	71	60
2, lap	75	66½	2, butt	72	61
2½ to 4, lap.	77	68½	1½, lap	55	44
			1½, lap	66	55
			2, lap	67	57
			2½ to 4, lap.	69	60

Butt Weld, extra strong, plain ends.

⅝, ¾ and ⅞	68	57½	¾	64	53
1	73	66½	¾	68	61
¾ to 1½	77	70½	¾ to 1½	72	63
2 to 3	78	71½	2 and 2½	73	64

Lap Weld, extra strong, plain ends.

2	74	65½	1½	66	60
2½ to 4	76	67½	2	67	59
4½ to 6	75	66½	2½ to 4	71	62
7 to 8	68	57½	4½ to 6	70	61
9 to 12	63	52½	7 and 8	64	54
			9 to 12	59	48

Butt Weld, double extra strong, plain ends.

⅝	63	56½	1½	58	50
¾ to 1½	66	59½	¾ to 1½	61	53
2 to 2½	68	61½	2 to 2½	63	55

Lap Weld, double extra strong, plain ends.

2	64	57½	2	56	50
2½ to 4	66	59½	2½ to 4	61	55
4½ to 6	65	58½	4½ to 6	60	54
7 to 8	58	47½	7 to 8	53	43

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads on lap-welded steel, in effect from February 1, 1913, and standard charcoal-iron boiler tubes, in effect from January 1, 1913, are as follows:

Lap-Welded Steel.		Standard Charcoal Iron.	
1½ and 2 in.	60	1½ in.	44
2½ in.	57	1½ and 2 in.	48
2½ and 2¾ in.	63	2½ in.	44
3 and 3½ in.	68	2½ to 2¾ in.	53
3½ to 4½ in.	70	3 and 3½ in.	55
5 and 6 in.	63	3½ to 4½ in.	58
7 to 13 in.	60	Locomotive and steamship special grades bring higher prices.	

2½ in. and smaller, over 18 ft., 10 per cent. net extra.
2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets.

Nos.	Cents per lb.
Nos. 3 to 8	1.70
Nos. 9 and 10	1.75
Nos. 11 and 12	1.80
Nos. 13 and 14	1.85
Nos. 15 and 16	1.95

Box Annealed Sheets, Cold Rolled.

Nos. 10 and 11	2.00
No. 12	2.00
Nos. 13 and 14	2.05
Nos. 15 and 16	2.10
Nos. 17 to 21	2.15
Nos. 22 and 24	2.20
Nos. 25 and 26	2.25
No. 27	2.30
No. 28	2.35
No. 29	2.40
No. 30	2.50

Galvanized Sheets of Black Sheet Gauge.

	Cents per lb.
Nos. 10 and 11	2.50
No. 12	2.60
Nos. 13 and 14	2.60
Nos. 15 and 16	2.75
Nos. 17 to 21	2.90
Nos. 22 and 24	3.05
Nos. 25 and 26	3.20
No. 27	3.35
No. 28	3.50
No. 29	3.65
No. 30	3.80

Pittsburgh

PITTSBURGH, PA., April 1, 1913.

Iron and steel makers in the Pittsburgh, Mahoning and Shenango valleys and Wheeling districts have been entirely concerned the past week over the great flood, which Pittsburgh practically escaped, and which did considerable damage in a financial way, but more in loss of tonnage in the manufacturing districts west of Pittsburgh. A report of the plants affected and of the extent to which operations are being resumed will be found elsewhere in this issue. Fortunately, the financial damage and loss of life in the Youngstown, New Castle and Wheeling districts are much less than at first supposed, the reports sent out having been greatly exaggerated. The flooded plants have suffered more or less damage, and the finishing departments, notably of the sheet and tin plate mills that depend on the large steel mills for their sheet bars, will no doubt experience more or less delay for some little time in getting steel. The loss of output was considerable, and some of the steel mills will not be working up to their full gait for several weeks. The movement of coke and coal is better than expected, but the regular running schedules will not be in force for perhaps a week. There were many washouts on the railroads, and some of these have been temporarily filled but the movement of freight trains will be slow for some time. The great delay in mails and the cutting off of telegraphic and telephone communication for three or four days naturally cut down very much the new orders, but several of the larger steel concerns report that their accumulated mails on Monday and Tuesday were heavy, some mail taking four days to reach this city from St. Louis. Specifications continue to come in freely, but the effects of the flood are bound to be felt for some time, both in turning out material and in shipments. Had it not been for the flood, March would certainly have been a record breaker, as up to about the 25th many of the steel plants in this district had broken all records for output in 25 days of any one month. Most concerns affected by the flood fully believe that they will be in good running order again by April 10 and making normal output.

Pig Iron.—With most of the blast furnaces in the two valleys and the Wheeling district and four in Pittsburgh closed down by the flood for four or five days last week, sales were not important. The report of a sale of 5000 tons of Bessemer iron for second quarter at \$17, Valley, is absolutely denied. There have been two or three small sales of Bessemer, one of 300 tons and another of 750 tons at \$17, Valley, but no sales are reported in basic or foundry. It is stated that several sellers are now offering No. 2 foundry as low as \$16, Valley, but others ask more. We quote standard Bessemer iron at \$17 to \$17.25; malleable Bessemer, \$16.25 to \$16.50; basic, \$16; No. 2 foundry, \$16 to \$16.50; gray forge, \$15.85, all f.o.b. cars Valley furnace, the freight rate to the Pittsburgh district being 90c. a ton.

Billets and Sheet Bars.—With all the Bessemer and open-hearth steel plants in the New Castle and Youngstown districts closed last week for four or five days, and some of them not yet in full operation, the consumers of billets and sheet bars apprehend that deliveries from the mills will be worse than they were before the flood occurred. Reports already received from several sheet and tin plate mills are that they are practically down waiting for steel. Small lots of billets and sheet bars continue to bring fancy prices. We quote Bessemer billets, \$28.50 to \$29; Bessemer sheet bars, \$29 to \$29.50; open-hearth billets, \$29 to \$29.50, and open-hearth sheet bars, \$29.50 to \$30, f.o.b. mill, Pittsburgh or Youngstown. Forging billets, \$36 to \$37, and axle billets, \$34 to \$35, Pittsburgh.

Ferroalloys.—The Western Maryland Railroad, which recently opened a line between Pittsburgh and Baltimore via the Pittsburgh & Lake Erie, announces that about April 10 it will put in effect a freight rate of \$2 a ton on ferromanganese and other alloys between Baltimore and Pittsburgh to such plants as it can reach in this city. The present rate is \$2.30, adopted Febru-

ary 1, and the Baltimore & Ohio and Pennsylvania railroads have announced they will meet the new rate as soon as it is made. There is still some ferromanganese being offered for resale and three carloads, or about 90 tons, are reported to have been sold at \$63, Baltimore, but foreign makers have reduced their prices this week to \$61, Baltimore, the freight rate for delivery in Pittsburgh district now being \$2.30 a ton. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at \$75; over 100 tons to 600 tons, \$74; over 600 tons, \$73, Pittsburgh. We quote 10 per cent. at \$24; 11 per cent., \$25; 12 per cent., \$26, f.o.b. cars at furnace, Jackson, Ohio, or Ashland, Ky. We quote ferrotitanium at 8c. per pound in carloads; 10c. in 2000-lb. lots and over and 12½c. in lots up to 2000 lb.

Wire Rods.—No new sales are reported but the market is firm. Specifications against contracts are coming in at a fairly satisfactory rate, but inquiry is light. We quote Bessemer, open hearth and chain rods at \$30, Pittsburgh.

Muck Bar.—No sales are reported, but we note a fair amount of inquiry. The scarcity of puddlers in Pittsburgh and other districts is preventing puddling plants from getting out their usual production of muck bar. We quote best grades made from all pig iron at \$33, Pittsburgh. Eastern muck bar is being offered at \$28 or less delivered in the Pittsburgh district.

Skelp.—The mills are pretty well filled for the present quarter and the market is firm. A reported sale includes about 1200 tons of grooved steel skelp for delivery in second quarter at about 1.45c., delivered at buyer's mill in the Pittsburgh district. We quote grooved skelp at 1.45c. to 1.50c.; sheared steel skelp, 1.50c. to 1.55c.; grooved iron skelp, 1.75c. to 1.80c.; sheared iron skelp, 1.85c. to 1.90c., delivered at buyers' mills in the Pittsburgh district.

Steel Rails.—Owing to the delay in the mails caused by the flood, new orders for standard sections and light rails have been light. The Carnegie Steel Company received new orders and specifications for about 2000 tons of light rails. We quote splice bars at 1.50c. per lb. and standard section rails at 1.25c. per lb. Light rails are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots f.o.b. Pittsburgh.

Structural Material.—Probably owing to the floods, there was very little doing here in the structural trade the past week. The Jones & Laughlin Steel Company has taken about 500 tons for part of a new power house to be built by the H. J. Heinz Company in this city, and another contract involving about 1600 tons for the same building is expected to be given out shortly. The American Bridge Company has taken 700 tons for a new building in the East and 200 tons for the new building of the Dollar Saving Fund and Trust Company in this city. We quote beams and channels up to 15 in. at 1.45c. to 1.50c. for delivery at convenience of the mill, which would be second half of this year, while small lots from warehouse for prompt delivery are bringing from 1.60c. up to 2c., depending on the size of the order and the deliveries wanted.

Plates.—The railroads have had something to think about other than the placing of contracts for steel cars, and few contracts were given out. The Illinois Central is reported to have placed a contract with the American Car & Foundry Company at Chicago for 1000 fruit cars and the Havana Central Railroad of Cuba placed 450 flat cars with the same company and 250 box cars with the Standard Steel Car Company of this city. The steel car shops report that deliveries of bars and small shapes by the mills have been very bad for some time, and they will probably be worse for the next two or three weeks. The supply of plates for reasonably prompt delivery is more plentiful, and premiums over regular prices are growing less. We quote ¼-in. and heavier tank plate at 1.45c., Pittsburgh, for forward delivery, while for shipment in three or four weeks 1.60c. to 1.65c. is quoted for carload and larger lots, and from 1.75c. to as high as 2c. for small lots, f.o.b. Pittsburgh.

Iron and Steel Bars.—The Carnegie Steel Company opened its books the past week for contracts for steel bars for delivery over last half of the year and has taken some fairly heavy contracts. The delays in the mails and the cutting off of telegraphic and telephone communication disarranged the bar business, but it is expected that the situation will be pretty well straightened out in the next week or 10 days. Mills report that new orders and specifications on Monday and Tuesday were fairly heavy. None of the iron or steel bar mills in the Pittsburgh district was affected to any extent by the floods, but shipments were greatly delayed, as all the railroads running westward were tied up for four or five days. We quote merchant steel bars at 1.40c. to

1.45c. for delivery at convenience of the mill, which would not be before third quarter, while for shipment from warehouses 1.90c. to 2c. is quoted. We quote iron bars at 1.70c. to 1.75c. for reasonably prompt delivery. Mills charge \$1 extra per ton for twisting 3/4-in. and larger steel bars and \$2 extra for 1/2 to 5/8 in.

Sheets.—The flood did much damage to the sheet mills in the Sharon and Youngstown districts and the output was materially reduced. When the flood was at its height the American Sheet & Tin Plate Company had six or seven of its larger sheet plants with 62 hot mills out of commission for four or five days; while all these plants have again started none is yet running to capacity, and probably will not be for a week or more. It is believed that the loss in output will have the effect of strengthening prices. The new demand continues heavy, and specifications against contracts are coming in freely. Several sheet mills that had been offering sheets for delivery in three or four weeks at about \$1 a ton under the regular market were closed last week on account of the flood. We quote 1.75c. for No. 10 blue annealed; 2.35c. for No. 28 Bessemer black sheets; 3.50c. for No. 28 galvanized, and 2.30c. for No. 28 tin mill black plate. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Hoops and Bands.—There is not much new buying, as consumers are covered through the second quarter and in some cases over the last half of the year. Mills report that specifications are coming in freely and they are still back in deliveries several weeks. We quote steel hoops at 1.60c. to 1.65c. and steel bands at 1.40c. to 1.45c., extras on the latter as per the steel bar card, these prices being for delivery at convenience of the mill. For prompt shipment premiums are being paid.

Merchant Steel.—The new demand is only fair, but specifications are good. One leading maker up to March 25 had shipped out the largest tonnage in its history in that part of a month. Prices are firm and we quote: Iron finished tire, 1 1/2 x 3/8 in. and larger, 1.40c. to 1.55c., base; under 1 1/2 x 3/8 in., 1.55c. to 1.65c.; planished tire, 1.60c. to 1.70c.; channel tire, 3/4 to 1 in. and 1 in., 1.90c. to 2c.; 1 1/2 in. and larger, 1.80c. to 1.90c.; toe calk, 2c. to 2.10c., base; flat sleigh shoe, 1.50c. to 1.65c.; concave and convex, 1.80c. to 1.90c.; cutter shoe, tapered or bent, 2.30c. to 2.40c.; spring steel, 2c. to 2.10c.; machinery steel, smooth finish, 1.80c. to 1.85c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1 1/2 in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.30c.; soft, 3.55c.; coils, hard, 3.20c.; soft, 3.45c.; freight allowed. The usual differentials apply for lighter gauges and sizes.

Tin Plate.—At one time, when the flood was at its greatest height, the American Sheet & Tin Plate Company had a total of 101 hot tin mills closed at various works, and was operating only 73 hot mills, so that its output was down to only about 40 per cent. of capacity. Other tin plate plants were closed and there was a large loss in their output. Most of the affected plants have again started but are not as yet running full. The tin plate mill of the Phillips Sheet & Tin Plate Company at Weirton, W. Va., will be out of commission for four or five weeks and perhaps longer, and its other plants at Clarksburg, W. Va., and Steubenville, Ohio, were down four or five days. For four or five days last week practically no mail was coming from the West, and specifications received were light. However, the effects of the flood will be pretty well over in a week or 10 days, and the mills look for heavy specifications, as stocks of consumers are reported to be pretty well depleted. The shortage in supply of steel is bound to be more acute than ever, as some of the steel mills that furnish tin bars to the trade will not be making steel at their normal gait for several weeks. We continue to quote 100 lb. cokes at \$3.60; 100 lb. ternes at \$3.45, and No. 28 black plate at \$2.30, all f.o.b. Pittsburgh.

Railroad Spikes.—The heavy floods of last week will probably prove a blessing in disguise to the spike trade, as a great many miles of track were washed away and will have to be rebuilt. The railroads are specifying freely against contracts, one leading road having sent in a specification for 4500 kegs. The shortage in supply of small spikes continues, and for prompt delivery they are quoted at \$2.15 to \$2.25 per 100 lb. at maker's mill. We quote railroad spikes in base sizes, 5/8 x 9/16 in., on large contracts with the railroads, at \$1.80, while for carload lots \$1.90 is charged; small railroad and boat spikes, \$1.90 to \$2 per 100 lb., f.o.b. Pittsburgh, for forward delivery.

Shafting.—The new demand is quiet, as most consumers are pretty well covered through second quarter and in some cases over the entire year at somewhat lower prices than are now in effect. Specifications

against contracts are reported as coming in at a fairly satisfactory rate. We quote cold-rolled shafting at 58 per cent. off in carload lots, and 53 per cent. in small lots delivered in base territory, the usual slight differential over these discounts being allowed to the very largest consumers.

Bolts and Rivets.—Makers report that specifications against contracts continue to come in freely, but the new demand has quieted down a good deal as consumers are pretty well covered through second and third quarters. Deliveries of bars and rods by the mills are unsatisfactory, and on account of the flood will no doubt be worse before they are better. Premiums for prompt deliveries of bolts and rivets have about disappeared. We quote button-head structural rivets at \$2.20 and cone-head boiler rivets at \$2.30 per 100 lb. The discounts on bolts are as follows, in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works:

Coach and lag screws	.....80 and 10% off
Small carriage bolts, cut threads	.....75 and 5% off
Small carriage bolts, rolled threads	.....75 and 10% off
Large carriage bolts	.....75 and 70% off
Small machine bolts, cut threads	.....75 and 10% off
Small machine bolts, rolled threads	.....75, 10 and 5% off
Large machine bolts	.....75, 70 and 7% off
Machine bolts with C.P.C. and T. nuts, small	75 and 5% off
Machine bolts with C.P.C. and T. nuts, large	.....70% off
Square hot pressed nuts, blanked and tapped	.....\$5.70 off list
Hexagon nuts	.....\$6.30 off list
C.P.C. and R. square nuts, tapped and blank	.....\$5.70 off list
Hexagon nuts, 3/4 and larger	.....\$6.60 off list
Hexagon nuts smaller than 3/4	.....\$7.20 off list
C.P. plain square nuts	.....\$5.20 off list
C.P. plain hexagon nuts	.....\$5.50 off list
Semi-finished hexagon nuts 3/4 and larger	.....85% off
Semi-finished hex. nuts smaller than 3/4	.....85 and 10% off
Rivets, 7/16 x 6 1/2, smaller and shorter	.....75, 10 and 10% off
Rivets, metallic tinned, bulk	.....3 1/2c. per lb. net extra
Rivets, tin plated, bulk	.....1 1/2c. per lb. net extra
Rivets, metallic tinned, packages	.....70, 10 and 10% off

Wire Products.—Several of the leading makers of wire products have notified their trade that unless specifications are received at once on old contracts on the \$1.65 and \$1.70 basis for nails and \$1.45 and \$1.50 for plain annealed wire they will be promptly canceled. The new demand since the advance in prices has been quiet, but as spring trade approaches specifications are showing betterment. The damage done to wire and wire nail mills in the Pittsburgh district by the flood was light and little output was lost. We quote makers' prices to jobbers as follows: Wire nails, \$1.80 base, per keg; cut nails, \$1.70 to \$1.75; galvanized barb wire, \$2.20 per 100 lb.; painted, \$1.80; annealed fence wire, \$1.60, and galvanized fence wire \$2, f.o.b. Pittsburgh, usual terms, freight added to point of delivery. Jobbers charge the usual advances over these prices for small lots from store.

Merchant Pipe.—In the Pittsburgh district the pipe mills affected by the flood were those of Spang, Chalfant & Co., Inc., and the Pennsylvania and Continental works of the National Tube Company. These mills were idle for four or five days, but are again in operation and will shortly be running to capacity. The delay in mails last week naturally cut down the new demand for pipe a good deal, but orders received Monday and Tuesday of this week are reported heavy. Regular discounts on iron and steel pipe are reported as being fairly well maintained.

Boiler Tubes.—The new demand for both locomotive and merchant tubes continues heavy, one leading maker having its entire output sold up over the next three months or longer, and on seamless tubing for about five months. Discounts on iron and steel tubes are reported to be firmly held.

Coke.—For four or five days all shipments of coke to the west and north of Pittsburgh were shut off, with 22 to 24 blast furnaces in the Mahoning and Shenango valleys banked for four or five days. Consumption of coke in these districts was almost at a standstill. Reports printed of a general embargo on coke by the railroads in the Mahoning and Shenango valleys were untrue, as all roads serving the valleys are open, but coke has not yet moved on the regular schedule. A Cleveland furnace interest has contracted for about 6000 tons of coke per month, April to June, at about \$2.25 per net ton, at oven. There has been a heavy blowing out of ovens in both the Connellsville regions and at other places, but with the resumption of blast furnaces affected by the floods many of these ovens will be in blast again in a few days. We quote best grades of furnace coke for prompt delivery at \$2.25, and it is probable it could be bought at a lower price. On contracts over the remainder of the year we quote standard grades of furnace coke at \$2.25 to \$2.40 at oven. We quote best grades of 72-hr. foundry coke for prompt delivery at \$3 to \$3.50 per net ton, at oven. The Connellsville Courier reports the output

of coke in the Upper and Lower Connellsville regions last week as 430,885 net tons, a decrease over the previous week of about 15,000 tons.

Iron and Steel Scrap.—The floods will no doubt force a good deal of scrap material on the mills. This condition, with an already dull market, will probably add to the quietness that has existed in the scrap trade for several months. Reports are that the Carnegie Steel Company recently bought 4000 to 5000 tons of heavy steel scrap for delivery at Munhall, paying \$15, delivered, for it. It would probably have been a heavier buyer had it not been for the floods, which while they did not affect the Homestead mills closed down for four or five days some of its other plants. Prices are weak. Low phosphorus melting stock has sold as low as \$16.50 for standard grades. Bundled sheet scrap is still being offered as low as \$9.50 at shipping point, and turnings are demoralized and cannot be sold at \$8.50, delivered. We quote per gross ton delivered in the Pittsburgh and nearby districts as follows:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	\$14.25 to \$14.50
No. 1 foundry cast	14.25 to 14.50
No. 2 foundry cast	13.25 to 13.75
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	10.50 to 10.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.25 to 16.50
No. 1 railroad malleable stock	13.50 to 13.75
Grate bars	10.75 to 11.00
Low phosphorus melting stock	17.00 to 17.25
Iron car axles	24.25 to 24.75
Steel car axles	17.75 to 18.00
Locomotive axles, steel	21.75 to 22.00
Locomotive axles, iron	26.00 to 26.25
No. 1 busheling scrap	13.25 to 13.50
No. 2 busheling scrap	9.50 to 9.75
Old carwheels	15.75 to 16.00
*Cast-iron borings	10.00 to 10.25
*Machine shop turnings	8.50 to 8.75
†Steel bar crop ends	16.00 to 16.25
Old iron rails	16.25 to 16.50
No. 1 railroad wrought scrap	16.00 to 16.25
Heavy steel axle turnings	12.50 to 12.75
Stove plate	10.25 to 10.50

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.

†Shipping point.

Chicago

CHICAGO, ILL., March 31, 1913.

Communication between Chicago and other points in every direction has been interrupted to some extent, while from the East and South isolation was, and in some instances is still, complete. The damage resulting from storm and flood and the probabilities for a normal resumption of operations are accordingly the topic of first interest. Coke from the East, pig iron from Ohio and the South and coal from the mines of southern Indiana and Illinois are products, the shipment of which is of most concern to local operations. Thus far they are unaffected. With respect to new business the local market was quiet the past week. The Chicago, Milwaukee & St. Paul Railroad distributed a week ago orders for 22,000 tons of open-hearth rails. In finished steel lines, steel bars are probably the most active item, notwithstanding the absence of additional contracting by the implement interests. Pig-iron inquiry is more active, but such sales as are reported indicate that the furnaces are willing to make a price to take the business. The local scrap market is not greatly changed from the situation as it has prevailed for the past few weeks except for a somewhat stronger feeling on the part of dealers and brokers.

Rails and Track Supplies.—The distribution of the Chicago, Milwaukee & St. Paul Railway Company's rail orders of a week ago, totaling 22,000 tons, gives to the Illinois Steel Company 8000 tons; to the Cambria and the Lackawanna Steel companies 5000 each and to the Pennsylvania and Bethlehem Steel companies 2000 tons each. Other inquiry for new track equipment is temporarily quiet but it is anticipated that in the repair of road beds through Indiana and Ohio the replacing of track will bring a number of small inquiries into the market. We quote standard railroad spikes at 1.00c. to 2c., base; track bolts with square nuts, 2.30c. to 2.40c., base, all in carload lots, Chicago; tie plates, \$33 to \$35 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—The largest single contract for fabricated steel reported as placed in the past week was for 1306 tons of viaduct and girder spans for the Duluth, South Shore & Atlantic Railway Company, award-

ed to the American Bridge Company. This company also took 245 tons for the Denver & Salt Lake Railroad Company. The Worden-Allen Company, Milwaukee, will furnish 972 tons for additions to the stamp mill and boiler house of the Ahmeek Mining Company, Michigan. Other structural projects are largely in the future, but the prospect both for buildings and bridges promises no small tonnage. New highway and railroad bridges projected, particularly the latter for replacing washed-out structures of both concrete and steel construction, will be an immediate issue. Eastern mills directly affected by floods and others handicapped by traffic conditions are advising customers that for the time being no definite statements can be made as to shipments. We quote for Chicago delivery mill shipment, on plain shapes, 1.63c. to 1.68c.

The pressure of the unusual volume of store orders on local jobbers' stocks has been the impetus for a number of improvements in facilities, with the result that service out of local store is probably better now than at any previous time. The continuance of heavy demand indicates that a large portion of the new business materializing is still very insistent as to delivery. We quote for structural material from store, 2.05c.

Plates.—Among the orders of the past week was the award of 160 tons for seed and oil tanks to the Wm. Graver Tank Works, East Chicago, Ind., by the Archer-Daniels Linseed Company, Minneapolis. No new car inquiries are reported but an aggregate of 10,000 is now up for figures. We quote for mill shipment, Chicago delivery, 1.63c. to 1.68c.

Orders for plates placed through local jobbers for mill shipment have, in many instances, bettered the delivery available to many small users from 30 to 60 days, and business of this character has been and is still an important part of the current tonnage. For shipment from local stock we quote 2.05c.

Sheets.—With a number of the sheet mills either shut down or in danger of sheet bar shortage, it is expected that the concessions of \$1 a ton which have been frequent the past few weeks will disappear, at least temporarily. On the other hand, the lower prices of spelter, which have been a contributing influence in the weakness of galvanized sheets, are more pronounced. Inquiry continues very good. We quote for Chicago delivery in carloads from mill: No. 28 black sheets, 2.53c.; No. 28 galvanized, 3.68c.; No. 10 blue annealed, 1.93c.

Out of store prices continue without change as follows: No. 10 blue annealed, 2.25c.; No. 28 black, 2.90c.; No. 28 galvanized, 4.15c.

Bars.—The demand for reinforcing bars is especially heavy and increasing. Among the implement interests there has been practically no additional activity in covering requirements although it is understood that most of the users have obtained quotations. The impression prevails that the larger interests have not yet fixed upon the tonnage or specifications their requirements will involve. Bar iron inquiry continues active, with a prospect for even larger sales. We quote for mill shipment as follows: Bar iron, 1.57½c. to 1.62½c.; soft steel bars, 1.58c. to 1.65c.; hard steel bars, 1.60c. to 1.70c.; shafting in carloads, 58 per cent. off; less than carloads, 53 per cent. off.

The call for bars, particularly twisted squares for reinforcing, has been such as to require special facilities for handling by the warehouses. The increase anticipated as a result of the greater use of concrete has been accentuated by special circumstances this spring. For delivery from store, we quote soft steel bars, 1.95c.; bar iron, 1.95c.; reinforcing bars, 1.95c. base with 5c. extra for twisting in sizes ¾ in. and over, and 7½c. extra for smaller sizes; shafting 51 per cent. off.

Rivets and Bolts.—The weakness shown by some of the manufacturers of rivets has been in no degree lessened, and current quotations show concessions of \$2 a ton and in some cases even more. New business in bolts is light. We quote from mill as follows: Carriage bolts up to ¾ x 6 in., rolled thread, 75-10; cut thread, 75-5; larger sizes, 70-2½; machine bolts up to ¾ x 4 in., rolled thread, 70-10-5; cut thread, 75-10; large size, 70-7½; coach screws, 80-10; hot pressed nuts, square head, \$5.70 off per cwt.; hexagon, \$6.30 off per cwt. Structural rivets, ¾ to 1¼ in., 2.38c., base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Out of store we quote for structural rivets, 2.70c., and for boiler rivets, 2.90c. Machine bolts up to ¾ x 4 in., 70-7½; larger sizes, 65-5, carriage bolts up to ¾ x 6 in., 70-5; larger sizes, 65 off. Hot pressed nuts, square head, \$5.30, and hexagon, \$5.90 off per cwt.

Wire Products.—Insistent demands for immediate delivery of wire nails have already begun to come in from Ohio, Indiana, Illinois and Central Southern territory, where shipments have been delayed and where the repairing of damages has created a sudden and unexpected demand. We quote as follows to jobbers: Plain wire, No. 9 and coarser, base, \$1.78; wire nails, \$1.98; painted barb wire, \$1.98; galvanized, \$2.38; polished staples, \$1.98; galvanized, \$2.33; all Chicago. An

unusually heavy demand for fencing is also expected to follow.

Cast-Iron Pipe.—The past week brought out routine inquiry and railroad sales in tonnages somewhat above the average but the call for municipal and gas pipe is still far below normal. A number of cities are finding difficulty in disposing of their bonds at prices that will enable them to finance extensive improvements. We quote as follows per net ton, Chicago: Water pipe, 4 in., \$30.50; 6 to 12 in., \$28.50; 16 in. and up, \$27.50, with \$1 extra for gas pipe.

Old Material.—There has been sufficient buying of scrap in this market the past week to strengthen the general sentiment. Prices, however, have not been materially affected, with the exception of a few small advances. Interruption of traffic, while it may enhance the value of some items by reducing the immediate supply, will operate to the contrary as in the case of borings and turnings where the consuming mills are temporarily shut down. Current railroad offerings of scrap include 2500 tons from the Chicago, Rock Island & Pacific, and 1200 tons from the Chicago & Northwestern. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.	
Old iron rails	\$16.25 to \$16.75
Old steel rails, perolling	14.75 to 15.25
Old steel rails, less than 3 ft.	14.00 to 14.50
Relaying rails, standard section, subject to inspection	24.00
Old carwheels	16.75 to 17.25
Heavy melting steel scrap	12.50 to 13.00
Frogs, switches and guards, cut apart.	12.50 to 13.00
Shoveling steel	12.50 to 12.75
Steel axle turnings	10.50 to 11.00

Per Net Ton.	
Iron angles and splice bars	\$15.75 to \$16.25
Iron arch bars and transoms	16.25 to 16.75
Steel angle bars	12.00 to 12.50
Iron car axles	21.00 to 21.50
Steel car axles	18.50 to 19.00
No. 1 railroad wrought	12.50 to 13.00
No. 2 railroad wrought	11.75 to 12.25
Cut forge	11.75 to 12.25
Steel knuckles and couplers	12.00 to 12.50
Steel springs	12.50 to 13.00
Locomotive tires, smooth	13.50 to 13.75
Machine shop turnings	7.75 to 8.25
Cast and mixed borings	6.75 to 7.25
No. 1 busheling	10.75 to 11.25
No. 2 busheling	7.75 to 8.25
No. 1 boilers, cut to sheets and rings.	8.75 to 9.25
Boiler punchings	12.50 to 13.00
No. 1 cast scrap	12.50 to 13.00
Stove plate and light cast scrap.	10.50 to 11.00
Railroad malleable	13.25 to 13.75
Agricultural malleable	11.50 to 12.00
Pipes and flues	9.25 to 9.75

Pig Iron.—(By Telegraph, April 2.) The pig-iron producers of this district, although out of the flood region, are at present more concerned with matters affecting operation than with the question of sales. Each of the local furnace interests is dependent for the larger portion of its coke upon shipments from the East, and unless these shipments, which have been interrupted the past week, are resumed within the next few days most of the furnaces will have to be banked. Latest reports indicate the possibility of getting more coke through, and the seriousness of the situation depends upon the success or failure of that effort. Two furnaces have already been banked, and immediate relief is all that will prevent a further limiting of operations. It is impossible to gauge with accuracy the effect on the pig-iron market, but it seems likely that prompt or spot shipment iron either from local furnaces or from the South will be quite unobtainable until the situation is readjusted. Malleable foundries are displaying interest in charcoal iron in view of the possibility of scarcity in coke malleable. Obviously, the foundry melt will also be affected by the coke situation and will follow a course parallel to that of the pig-iron producers. During the week inquiry for Northern iron has been more active, though limited to small lots. Sales have not been heavy for Southern iron. Inquiry has been light and such transactions as are reported, some of them on as low a basis as \$13, Birmingham, for No. 2, show a continued weakness in pig-iron values. Ohio River conditions have made shipments from the South to Chicago territory impossible for several days, but reports of improvement at Cincinnati indicate that traffic may be resumed via that point some time before it can be resumed through Evansville and Cairo. The policy of delaying purchases still predominates among buyers. The following quotations are for iron delivered at consumers' yards except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4....	\$18.00 to \$18.75
Northern coke foundry, No. 1.....	17.75 to 18.25
Northern coke foundry, No. 2.....	17.25 to 17.75
Northern coke foundry, No. 3.....	16.75 to 17.25
Southern coke, No. 1 foundry and No. 1 soft	17.85 to 18.35
Southern coke, No. 2 foundry and No. 2 soft	17.35 to 17.85
Southern coke, No. 3.....	16.85 to 17.35
Southern coke, No. 4.....	16.35 to 16.85
Southern gray forge.....	16.35 to 16.85
Southern mottled.....	16.35
Malleable Bessemer.....	17.25 to 17.75
Standard Bessemer.....	19.40 to 19.90
Basic.....	17.25 to 17.75
Jackson Co. and Kentucky silvery, 6 per cent.....	20.40
Jackson Co. and Kentucky silvery, 8 per cent.....	21.40
Jackson Co. and Kentucky silvery, 10 per cent.....	22.40

Philadelphia

PHILADELPHIA, PA., April 1, 1913.

Eastern mills and furnaces have not felt the serious effect of the storms which have paralyzed the industry in the West. The trade will be seriously inconvenienced, however, by the non-delivery of materials under contract with Western producers. Railroads refuse to accept materials from Eastern producers for shipment into or beyond the flooded districts. Eastern mills are for the most part well sold up, although in some lines deliveries are coming through more freely, but there is little available to take the place of early deliveries from the West. Pig iron has been more active, particularly in the pipe-making grades. Basic, long in meager demand, has been sold at price concessions. New business in finished materials continues at a fair rate, but mills are catching up with deliveries on some sizes. Prices have an appearance of easiness, but this is due to the gradual reductions in premiums rather than any concessions from the base price. The coke market is demoralized owing to the holding up of shipments from coke ovens to the West and prices are ragged. The old material market is stronger, up to \$14, delivered, having been paid for No. 1 heavy melting steel.

Iron Ore.—The most important transaction in a long time was one recently consummated between the Alan Wood Iron & Steel Company and the Canadian Venezuelan Iron Ore Company, Ltd., for a purchase of 500,000 tons of Imataca ore, for delivery at the rate of 100,000 tons per year, over five years. Prices and details are withheld. Outside of this transaction the market has been quiet. Importations of the week include 10,542 tons of ore from Sweden, 5500 tons from Greece, 2800 tons from Venezuela, 2777 tons from Spain and 11,350 tons from Cuba.

Pig Iron.—Considerable activity has developed, but the bulk of the buying has been in low-grade and basic iron. Cast-iron pipe makers have been heavy purchasers. One interest recently in the market for 3000 tons closed for 5000 tons, taking 2000 tons of Northern iron at close to \$16.50, and 1500 tons each of Southern No. 3 and gray forge at \$12.25 and \$12, Birmingham, equal to \$16.45 and \$16.20, respectively, delivered Delaware River points. Another pipe maker has bought about the same quantity of low-grade iron, also dividing orders between Southern and Northern makers. Several thousand tons of Northern iron was sold this buyer at a range of \$16.25 to \$16.50, delivered. The Southern iron was on a basis of \$13, Birmingham, for No. 2 foundry. Still further buying of low grade in various lots is reported and the aggregate sales for the week will total from 12,000 to 15,000 tons, with buyers still in the market. Few inquiries for the higher grades of foundry iron have resulted in large sales. Buyers still hesitate when it comes to placing orders for any material quantity; in fact, few inquiries in excess of 500 tons have come out. General business, however, is larger, although transactions are confined to small lots, few exceeding 100 tons, which are moving at prices ranging from \$17.75 to \$18, delivered, at which range prices now seem to be pegged. Virginia foundry appears very quiet. Recent offerings of resale iron, at price concessions, have practically disappeared, all the iron taken for resale in this district having been disposed of; with the demand quiet, producers are not making concessions, but a good buyer could, no doubt, shade present quotations of \$15.50, furnace, for No. 2X. A recent inquiry for a moderate lot of coke malleable is reported as being still open. There has been more movement in rolling mill forge, moderate lots going at \$16.65 to \$17, according to grade and quantity; more activity is expected, a large buyer being nearly due in the market. Steel-making grades are more active. Basic pig, which has been practically at a standstill for some time, has been sold at concessions. One Eastern melter has taken 10,000 tons for second quarter, the business being

placed with several furnaces at prices very close to \$17, delivered Eastern mill. A large buyer is expected to come into the market in the next week or two for a block of basic for third-quarter shipment. Low-phosphorus pig has developed some weakness, owing largely to the continued lack of important buying. A sale of 500 tons of standard analysis iron was made at \$24, delivered, although small lots have been sold at \$24.50. Prices generally now appear on a firmer basis. There is less disposition to make further cuts, as more active buying is expected. The following range about represents the market for standard brands, delivered in buyer's yard, in this district:

Eastern Pennsylvania No. 2 X foundry	\$17.75 to \$18.00
Eastern Pennsylvania No. 2 plain	17.50 to 17.75
Virginia No. 2 X foundry	18.30 to 18.50
Virginia No. 2 plain	18.05 to 18.25
Gray forge	16.75 to 17.00
Basic	17.00 to 17.25
Standard low phosphorus	24.00 to 24.50

Ferroalloys.—There is practically an entire absence of demand either for prompt or forward shipment. Foreign makers of 80 per cent. ferromanganese are showing weakness and are naming \$61, seaboard. Importations of ferromanganese at this port last week aggregated 450 tons. Very little business is moving in ferrosilicon. Small inquiry for furnace grades is noted, but sellers are unable to quote owing to the inability to get in communication with producers in the West, owing to flood conditions.

Billets.—The demand has been fairly active, both for forging and rolling steel. Eastern mills, being well sold up for the second quarter, are booking less business and are disinclined to enter heavy orders for more extended shipment. The market is firm at recent quotations, namely, \$30 to \$32, delivered here, for rolling billets, according to tonnage and \$36, minimum, for ordinary forging steel.

Plates.—Eastern mills are still receiving a very fair run of business. Deliveries are a trifle easier. Shipments to the West have been held up by the inability of the railroads to make deliveries owing to the floods. This has had the effect of slightly improving deliveries in the East. Orders during the week have been rather general, but for car, bridge and tank work have been quite good. Prices are being firmly maintained by Eastern makers, 1.75c. to 1.80c., delivered here, being quoted. Western mills still name 1.65c., delivered here, although deliveries are extended.

Structural Material.—Some of the Eastern mills are gradually catching up on orders for the heavier sizes and can make much better deliveries. On the smaller sizes, however, shipments are, if anything, more extended. A very good volume of miscellaneous business is moving and plant activities are fully maintained. Considerable bridge building is being figured on and it is expected that the demand in that direction will be materially increased. An inquiry for several thousand tons of material for an apartment house is before the trade, while plans for the new office building for the Finance Company, on South Penn square, have been filed. Premiums for prompt shipments of plain shapes are less in evidence and there is also a disposition to more closely approach Western prices than has recently been the case. For reasonably early delivery Eastern mills are quoting 1.70c. to 1.75c. for plain shapes, delivered in this district, while for more extended shipment Western mills quote 1.65c. here.

Sheets.—A good demand is reported by Eastern makers, although few large orders have been taken. One Eastern producer has been temporarily closed down owing to labor troubles, which are expected to be adjusted in a few days. Western sellers have been handicapped by floods and deliveries are somewhat uncertain. Prices are being well maintained, Western No. 10 blue annealed being quoted, for delivery in this vicinity, at 1.90c., while Eastern mills making smooth loose rolled sheets, for reasonably early delivery, obtain 2c.

Bars.—Business in iron bars continues to come to the Eastern mills quite freely. Specifications have been good, mill activities are fully maintained and a large volume of business is on order books. There has been no weakening of prices, ordinary iron bars being firm at 1.60c. mill, minimum, equal to 1.67½c., delivered in this vicinity, and for the better grades higher prices are readily obtained. Considerable business is pending in steel bars. Western floods have held up the booking of some business, as mills are badly tied up and in instances are hardly expected to get in full operation again for several weeks. Steel bars are firm at 1.55c. to 1.60c., delivered here, with prices ranging up to 1.85c. for prompt shipment.

Coke.—The market is much upset and prices are irregular, owing to the accumulation of coke at ovens, due to the inability of the railroads to make Western deliveries. Upward of 6000 tons of furnace coke for early delivery was sold in this district last week at prices ranging from \$2 to \$2.45, at oven, and materially lower prices have been named, largely on coke which was on cars and had to be moved. Standard foundry coke has been available at a wide range of prices dependent on delivery, \$2.50 to \$3.50 representing the full range of the market. For delivery in buyers' yards in this district the following range, per net ton, is named:

Connellsville furnace coke	\$4.25 to \$4.75
Connellsville foundry coke	4.90 to 5.65
Mountain furnace coke	4.15 to 4.65
Mountain foundry coke	4.60 to 5.10

Old Material.—The market is of decidedly stronger tone, although there has not been much activity as far as general buying is concerned. Heavy melting steel is stronger, recent purchases having been made by one Eastern mill at \$14, delivered, several thousand tons being involved. This mill has bought in the past few weeks some 15,000 tons of No. 1 heavy melting steel at prices ranging from \$13 to \$14 a ton. A number of buyers are quoting slightly over \$14, delivered, for steel on this month's railroad lists. Dealers are offering \$13.75 and in instances slightly better for this grade, to apply on contracts. Borings and turnings have also been in better demand and prices are slightly better. Wrought pipe has been more active and prices are a trifle higher. Quotations, while to a certain extent nominal, range about as follows, for small lots, delivered in buyers' yards in this district, covering eastern Pennsylvania and nearby points, taking a freight rate varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel	\$13.75 to \$14.00
Old steel rails, rerolling (nominal)	15.50 to 16.00
Low-phosphorus heavy melting steel scrap	17.75 to 18.00
Old steel axles (nominal)	19.00 to 20.00
Old iron axles (nominal)	27.00 to 28.00
Old iron rails	18.00 to 18.50
Old carwheels	15.00 to 15.25
No. 1 railroad wrought	16.00 to 16.50
Wrought-iron pipe	13.00 to 13.50
No. 1 forge fire	12.50 to 13.00
No. 2 light iron (nominal)	7.00 to 7.50
No. 2 cut busheling	10.00 to 10.50
Wrought turnings	10.75 to 11.25
Cast borings	10.50 to 11.00
Machinery cast	14.00 to 14.50
Grate bars, railroad	10.50 to 11.00
Stove plate	10.50 to 11.00
Railroad malleable (nominal)	13.00 to 13.50

Cleveland

CLEVELAND, OHIO, April 1, 1913.

Conditions in the iron and steel industries in Ohio are rapidly improving. Railroad traffic has been opened up on all the most important lines, although some of the smaller roads running south from Cleveland are still shut down. While the flood damage is bound to result in considerable freight congestion for a time, conditions are now better than expected. Coke is moving much more freely, and with few exceptions blast furnaces that were banked from five to seven days have resumed operations. In Cleveland eight furnaces out of nine active were banked. Six of these are again running and the remaining two are expected to resume by the end of the week.

Iron Ore.—Dock shipments that had been suspended the latter part of last week because of flood conditions, were resumed again this week, but it will be several days until the movement becomes normal. A sale of about 60,000 tons of standard non-Bessemer ore is reported, being the first sale of any size for a number of weeks. In view of the general conditions, sellers are not looking for any activity in the market for at least two or three weeks. The work of fitting out boats for the ore trade will be started next week, but indications are that ice conditions will not permit an opening of navigation earlier than last year. While one ore firm has taken an option for vessel tonnage at an advance of 5c. a ton over present charges, ore shippers quite generally feel that they will be able to get all the additional vessel tonnage needed at the regular rates. As vessel capacity has been chartered for ore already sold, not a great deal of additional vessel capacity will be required and the vessel tonnage available will probably exceed the demand. We quote prices as follows: Old range Bessemer, \$4.40; Mesaba Bessemer, \$4.15; old range non-Bessemer, \$3.60; Mesaba non-Bessemer, \$3.40.

Pig Iron.—The market is virtually at a standstill.

For the past few days furnace companies have devoted their entire attention to getting their banked furnaces in operation. Many foundry stocks are low and consumers are clamoring for iron. This is especially true of basic. There is a possibility that some basic consumers will be seriously inconvenienced by not getting their iron as soon as needed. While the consumption of all grades was reduced, the production was curtailed to a much greater extent. Furnace companies expect to be making shipments about as usual toward the end of the week. Several sellers withdrew from the market when their furnaces were banked, but now that the situation is cleared up they will soon consider the booking of orders. The floods do not seem to have affected the price situation. Foundry iron appears to have settled down to \$16, Valley furnaces, for No. 2 for last-half delivery. Foundry iron for early local delivery is weaker. The only inquiry reported is from an Akron consumer for 300 tons of No. 2 soft and 300 tons of No. 2 strong for the last half which came out last week and is still pending. The United Steel Company, Canton, Ohio, which was in the market for 5000 tons of basic, is understood to have divided the order between two Cleveland interests. Southern iron is weak and quiet, being quoted at \$13 for last-half delivery. This price can possibly be shaded for early shipment. For prompt shipment and the second quarter we quote, delivered Cleveland, as follows:

Bessemer	\$18.15
Basic	17.00
Northern No. 2 foundry	\$16.75 to 17.00
Southern No. 2 foundry.....	17.35
Gray forge	16.25 to 16.50
Jackson County silvery, 8 per cent. silicon. 20.55 to 21.55	

Coke.—Several blast furnaces outside of the flood districts had a hard time to secure coke the latter part of the week, but the most important railroad lines are now getting shipments through from the Connellsville region and the danger of having to bank stacks because of scarcity of fuel has apparently passed. Many foundries are getting short of coke, but will probably secure shipments before their supplies are totally exhausted. Lower prices on furnace grades for prompt shipment are looked for in the next few days because of the temporary falling off in consumption. We quote standard Connellsville furnace coke at \$2.25 to \$2.40 per net ton at oven for prompt shipment and \$2.50 for contract. Standard foundry coke is held at \$3.50 for prompt shipment and contract.

Finished Iron and Steel.—As the conditions resulting from the flood are disappearing, the market is assuming a more normal aspect. For several days communication by rail, mail, telephone and telegraph between sellers in Cleveland and buyers throughout the State was cut off and business was largely at a standstill. Orders are now coming in in fairly plentiful volume, and mills are making promises to have material ready for shipment on certain days but no promises as to the time of delivery because of the condition of the railroads. The Ohio floods will result in a demand for a very heavy tonnage of steel for railroad and highway bridge work to replace structures that were washed out. Much of this material will be wanted for early delivery. The May Company, Cleveland, will within the next few months erect a large building for mercantile purposes that, according to estimates, will take from 4000 to 5000 tons. The Firestone Tire & Rubber Company, Akron, will require 200 tons for a factory addition. The Forest City Steel & Iron Company, Cleveland, has taken 70 tons for the city for a bath house. Forging billets are in fair demand and are being quoted in the local market at \$33 to \$34, Eastern mill. Some of the implement makers in this territory are placing steel bar contracts for the last half, the mills refusing to make contracts for a full year. Sheet specifications are fairly good and deliveries have been delayed by the shutting down of several Ohio mills during the floods. Warehouse business during the week fell off, being confined mostly to city orders. Stock prices are unchanged at 2.10c. for steel bars and 2.25c. for plates and structural material. Bar iron is in moderate demand, with the price firm at 1.60c. to 1.65c., Cleveland.

Old Material.—The market is stagnant as a result of the floods. Railroads have embargoes on scrap to many points and dealers are not trying to make shipments. Mills were well supplied with material in yards and on cars before the railroad traffic became demoralized and are not in need of scrap. Several of the Cleveland yards were flooded last week and are not yet in good shape for handling material. The market is weak but quotations are largely nominal. Dealers expect more activity

late in the week at possibly about 25c. under current quotations. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton.	
Old steel rails, rerolling	\$14.50 to \$15.00
Old iron rails	16.00 to 16.50
Steel car axles	18.75 to 19.25
Heavy melting steel	12.75 to 13.00
Old carwheels	15.00 to 15.50
Relaying rails, 50 lb. and over.....	23.00 to 25.00
Agricultural malleable	11.50 to 12.00
Railroad malleable	13.50 to 14.00
Light bundled sheet scrap	10.00 to 10.50
Per Net Ton.	
Iron car axles	\$21.00 to \$21.50
Cast borings	7.00 to 7.50
Iron and steel turnings and drillings.....	5.75 to 6.25
Steel axle turnings	9.00 to 9.25
No. 1 busheling	11.50 to 12.00
No. 1 railroad wrought	13.50 to 14.00
No. 1 cast	12.50 to 13.00
Stove plate	9.00 to 9.50
Bundled tin scrap	11.00 to 11.50

San Francisco

SAN FRANCISCO, CAL., March 25, 1913.

A much better feeling is noted in the local trade after a week of showers, which has relieved the great anxiety recently felt concerning the crop outlook, although some districts are still rather dry. The movement in nearly every line is heavier than a year ago, with signs of increasing activity in the second quarter. Buyers in general have specified to the full extent of their contracts for this quarter, and specifications for second quarter are beginning to appear, while merchants show some disposition to cover more distant requirements. Manufacturers show reluctance to buy for the distant future, but are buying freely for current needs. Local building has been rather quiet, but shows some improvement.

Bars.—Distributive trade is well maintained. A more general demand is expected for the coming month. Foreign material has recently been offered for shipment at 1.97½c., landed in San Francisco, duty paid, but while it is expected that some will be ordered for reinforcing purposes, merchants have taken little interest in such offerings. They are not at present inclined to buy far in advance, owing to uncertainty as to tariff changes, and are drawing on the stock carried here by the United States Steel Products Company for immediate needs. Inquiry for reinforcing material continues heavy, and large orders are expected from several outside points. Delay in wharf construction is giving local mills some tonnage for prompt delivery, for which attractive prices are received. The coast output of iron bars also finds a ready market. Jobbing prices remain at 2.75c. for steel and 2.65c. for iron.

Structural Material.—Local shops still have comparatively little work on hand. Though eager for business they are deterred from building on many jobs owing to scarcity of material. Arrivals on old contracts are a little better, enabling some shops to handle small work with fair promptness, but anything of importance would be subject to delay. This condition has led to the use of reinforced concrete in many buildings which would normally have been of steel frame construction. Owing to threatened labor trouble, the California Construction Company has withdrawn its bid on the Oakland auditorium, and new figures will be taken. It is denied that this is a subsidiary of the American Bridge Company, which it represented on this occasion. Local jobs recently let are an 8-story class C building at Taylor and Post streets, to the Brode Iron Works, and the Hind Estate building on California street, to the Pacific Rolling Mill Company. An award is expected in a few days on the Cliff estate building, 1300 tons, and plans will be out soon for the Carlson & Snyder building in Oakland. Figures are being taken on the Washington Securities building, Seattle, and a contract is expected on the Home Builders' building at Los Angeles. Plans for the Roebling warehouse in that city are being altered, and reinforced concrete may be used throughout. Arrangements are being made with the Southern Pacific and Santa Fe railroads for a drawbridge at Islais Creek, this city. Plans have just been announced for two local buildings of unusual importance—one of 25 stories at Fourth and Market streets for J. D. Spreckles, for which Reid Bros. are the architects, and a 12-story building on the Hobart estate lot, Market near Sutter street, Willis Polk & Co., architects.

Rails.—Little has been heard of late regarding the more important inquiries expected this spring, though a good tonnage of heavy sections is being taken in moderate lots and larger business may develop at any time. Orders are still coming in freely for light rails,

and considerable business is coming from logging interests of the north coast. The Harbor Commission has been authorized to extend the local belt road to the Presidio.

Sheets.—Old contracts are about cleaned up, and many buyers are sending in specifications for second quarter. Jobbing trade has been highly satisfactory for March, and a more general consuming demand from the small shops is expected next month. The larger manufacturers of sheet products are working practically at capacity, and there is no indication of curtailment in prospect, though they are conservative about placing contracts.

Plates.—Conditions show little change, the local jobbing and boiler shop trade being light, while manufacturers' requirements are comparatively large, with a good volume of tank work in sight. The Union Oil Company is planning a large distributing plant at San Bernardino, Cal., and the Portland Gas & Coke Company, Portland, Ore., is preparing for a number of improvements, including a large gas holder. The prospect of additional shipbuilding work on the Pacific is very uncertain.

Merchant Pipe.—Merchants are still too well supplied to buy on a large scale, and while the small trade in the country is fair the requirements of the plumbing business are hardly up to expectations. There has been a good country demand for well casing, and the oil field business is rapidly gaining headway. The drilling of several experimental oil wells near Seattle, Wash., is attracting some attention. A deal reported between the railroads and the General Pipe Line Company for oil transportation to southern California may delay the construction of the new Tehachapi line which has been in contemplation.

Cast Iron Pipe.—No orders of much importance have been placed lately, though a fair tonnage is going to corporations, and a number of municipal inquiries are out, with many more in prospect. The town of Linton, Ore., will take bids in April for about 1500 tons, and Mayfield, Cal., will take bids on a small lot April 7. Suisun, Cal., is in the market for about 300 tons, and Lodi, Cal., has placed a small order. The town of Richmond plans a municipal water system. Prices are quoted at \$36.50 for 4-in. and \$34.50 for 6-in. or larger.

Pig-Iron.—Buying is still on a conservative scale, though considerable tonnage is being taken for prompt shipment, local foundry requirements being about the same as for some months past. Prices are steadily held for the rather limited supplies of foreign iron in importers' stocks, while No. 2 Southern foundry is quoted at \$23.60 to \$24.10, and No. 1 Alabama Scotch at \$24.75 to \$25, per gross ton.

Coke.—There is no great volume of spot business at the moment, though supplies on hand are rapidly decreasing and no foreign coke will be in for several months. A considerable tonnage is being loaded for this port, however, and sales of German Syndicate coke for shipment by sailing vessel are being made at \$13 to \$13.50 per gross ton.

Old Material.—The requirements of local steel plants and foundries have been comparatively large for some time, and supplies are running decidedly light, with the prospect of an actual shortage in practically all lines. With renewed inquiry the tendency of prices is upward, though values are rather unsettled at present. Relaying rails are in strong demand, and sales are reported at \$35 per net ton. Other quotations are as follows: Cast-iron scrap, net ton, \$15; steel melting scrap, gross ton, \$13.50; wrought scrap, net ton, \$12.50 to \$15; reolling rails, net ton, \$11.

Birmingham

BIRMINGHAM, ALA., April 1, 1913.

Pig Iron.—Southern furnacemen appear to have practically stopped the price recession at \$13. This is asked and paid in the majority of instances for spot and 30-day delivery, while \$13.25 and \$13.50 are asked for the second half, with little effort made to place orders running into that period. There have been sales of 500 tons each of Nos. 3 and 4 foundry at \$12.50 and \$12, respectively, which is on the \$13 basis for No. 2. Carload lots were sold in the week at \$13 and \$13.25 for ordinary iron. One furnace, which has been selling at low prices, is now reported to be asking \$13.25 and is moving its accumulations at the rate of 900 tons a day against a make of 200 tons, half of which is used in an auxiliary plant at the furnace. Stocks have continued to accumulate in some quarters, notably in one instance where selling at concessions has been reported. One large

concern sold more iron in March than in any month this year. The entire foundry capacity of the South seems to be occupied. On the whole the Southern iron market is regarded as stronger than it has been in some time. It is understood that the demand for basic iron has resulted in a determination by one interest to change a newly-lighted furnace from foundry to basic. Prices for early delivery and second half f.o.b. cars at furnace are as follows:

No. 1 foundry and soft.....	\$13.50 to \$14.00
No. 2 foundry and soft.....	13.00 to 13.50
No. 3 foundry	12.50 to 13.00
No. 4 foundry	12.25 to 12.75
Gray forge	12.00 to 12.50
Basic	13.00 to 13.50
Charcoal	25.00 to 25.50

Cast-Iron Pipe.—The manufacturers of water pipe are not yet in receipt of any of the large orders on which figuring has been done from time to time, owing to the fluctuations in the iron market, which both pipe user and maker are watching closely. The output is large and orders for small lots are considerable in the aggregate. Prices remain at the level recently established, which is \$23.50 for 4 in. and \$21.50 for 6 in. and upwards.

Coal and Coke.—The maximum operations at the furnaces call for a large coal output and mining operations are greater in volume than at this time last year. A few mines are troubled with water. Steam coal is in strong demand. Foundry coke continues to hold its strength and the prices are not changed, being from \$3.50 to \$4.25. Some Virginia coke sold by Birmingham parties for Texas delivery commanded a \$4.50 Birmingham basis.

Old Material.—Old material is not in great demand and prices are not as firm as they have been. Scrap is off 25 cents and more. Owing to the small amount of business done, prices are nominal and we still quote f.o.b. cars at dealers' yards as follows, per gross ton:

Old iron axles	\$15.50 to \$16.00
Old steel axles	15.50 to 16.00
Old iron rails	14.00 to 14.50
No. 1 railroad wrought	12.50 to 13.50
No. 2 railroad wrought	10.50 to 11.50
No. 1 country wrought	10.00 to 10.50
No. 2 country wrought	9.00 to 9.50
No. 1 machinery cast	10.50 to 11.00
No. 1 steel scrap	11.00 to 11.50
Tram carwheels	11.00 to 11.50
Standard carwheels	12.50 to 13.00
Light cast and stove plates.....	9.00 to 9.50

St. Louis

ST. LOUIS, Mo., March 31, 1913.

The interruption of mail service in the Central West has had some effect in this market, chiefly from the inability of representatives of furnaces and mills to communicate with higher authority. Business generally has been somewhat quiet, so far as new contracts are concerned, though a satisfactory tone is maintained.

Pig Iron.—The disturbing element at present is the continued offering of resale iron, though there is strong evidence that only a comparatively small quantity of this remains. However, as the consumers of large quantities are holding out of the market this small quantity is as powerful as a larger amount would be in disturbing quotations. The resale quotation for No. 2 Southern is \$12.75, Birmingham basis, but there are intimations that any considerable purchase could be made at \$12.50. Furnace representatives are firm at \$13 for the remainder of the first half and are making no quotations at all for the last half. Movement on specifications continues heavy, with increasing tendency to urge anticipation of allotments. No consumers at all are holding back, with the result that representatives are confident that buying will soon be inevitable.

Coke.—The market is in a nervous state because of probable interference with deliveries by the floods and there is a fear that consumers will have to shut down to some extent. By-product coke continues on a parity with the Connellsville quotation.

Old Material.—The scrap market is suffering from an absence of genuine demand as well as an embargo put up by the mills in this vicinity and lack of mail communication with Eastern points. It has been very dull and little or no change is to be reported in the quotations. Some items, however, are revised in a small way. There are a few inquiries out for relaying rails. The railroad lists out to close this week include 3000 tons from the Missouri Pacific and about 400 tons from the Frisco. The Harry Benjamin Equipment Company, in conjunction with the Hyman-Michaels

Company, the latter of Chicago, reports the purchase of the line from Silver City to Pinos Altos, N. M., about 22 miles, operated by the Savanna Copper Company. The purchase includes all the equipment, machine shops, etc., as well as the rolling stock and rails. The line when new cost, it is stated, about \$300,000. It is now being taken up for disposal. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.	
Old iron rails	\$13.00 to \$13.50
Old steel rails, re-rolling	13.25 to 13.75
Old steel rails, less than 3 ft.	11.75 to 12.25
Relaying rails, standard section, subject to inspection	22.50 to 23.50
Old carwheels	15.00 to 15.50
Heavy melting steel scrap	11.50 to 12.00
Frogs, switches and guards, cut apart	11.00 to 11.50

Per Net Ton.	
Iron fish plates	\$11.50 to \$12.00
Iron car axles	19.50 to 20.00
Steel car axles	17.00 to 17.50
No. 1 railroad wrought	11.25 to 11.75
No. 2 railroad wrought	11.00 to 11.50
Railway springs	10.00 to 10.50
Locomotive tires, smooth	11.50 to 12.00
No. 1 dealers' forge	8.50 to 9.00
Mixed borings	6.50 to 7.00
No. 1 busheling	10.00 to 10.50
No. 1 boilers, cut to sheets and rings	7.00 to 7.50
No. 1 cast scrap	10.50 to 11.00
Stove plate and light cast scrap	8.00 to 8.50
Railroad malleable	9.75 to 10.25
Agricultural malleable	8.00 to 8.50
Pipes and flues	7.00 to 7.50
Railroad sheet and tank scrap	6.50 to 7.00
Railroad grate bars	7.50 to 8.00
Machine shop turnings	7.50 to 8.00
Bundled sheet scrap	6.75 to 7.25
Wrought arch bars and transoms	14.00 to 14.50
Steel couplers and knuckles	10.00 to 10.50

Germany Waiting for War's End

Steel Bars the Most Sensitive—Pig-Iron and Semi-Finished Steel Firm

BERLIN, March 19, 1913.

A quiet, waiting attitude characterizes the iron trade. Everybody is hoping for an early termination of the Balkan war and the settlement of the political problems involved in the breakdown of Turkey. After that shall have been accomplished a revival of activity in the entire trade is looked for. In general, it may be said that the position of finished products is less satisfactory than that of ores and crude iron and steel.

Ores continue firm. In the Silesian district it is even said that the mine-owners hope to raise prices soon, and in the Luxemburg-Lorraine district minettes are scarce. The large works there are bidding actively for the remaining ore-lands of the Luxemburg Government, which are to be leased May 1. In the Siegerland region the mines are being worked to their full capacity, and their product is already sold to the end of the year. There is very active buying of Spanish and Mediterranean ores. Owing to recent ocean freight reductions, it is now possible to lay down these ores on the Ruhr at 19.50 to 20.50 marks for 50 per cent. These prices hold, however, only for nearby deliveries, the further movement of freight rates at sea being too uncertain to render longer engagements advisable for importers. Rich manganese ores remain steady in price notwithstanding the better freight rates. Swedish ores, so far as any are available for current needs, are firm.

Pig Iron and Semi-Finished Steel

As to pig-iron, the output for the first half of the year is sold, and the furnaces are still unable to make shipments on current orders as fast as customers desire. There appears to be no let-up in the rate of production. March will apparently establish a new record. The long-standing complaint of the trade that the big mixed concerns are not only not delivering iron to the Syndicate, but are themselves compelled to buy outside supplies for their own demands, is still heard. Prices for the second half-year will soon be fixed. It is hardly expected that any change will be made.

Consumers of semi-finished steel, like those of pig-iron, are still complaining of delays in deliveries, but this is now less marked than several months ago. Orders for the next quarter have been coming in briskly since the price scale was given out several weeks ago. Producers of open-hearth steel, although not in the Union and having no trade combination, are also unable to keep up with their orders. Foreign business in all semi-finished products continues rather quiet, but there are orders in hand reaching beyond the turn of the half-year, with calls for delivery rather more active.

Steel Rails Active

Dealers have been rather leisurely ordering beams and other structural shapes since the price-list for the second quarter was adopted, but calls for delivery are quite good when the conditions in the building trades are taken into consideration. Not much new foreign structural business is coming into sight. Universal shapes are more active.

Work in steel rails is extremely active owing to the enlarged orders of domestic railroads, and the mills can hardly make shipments as fast as rails are called for. Much new work from the Prussian roads for remoter dates has come into sight, a bill calling for appropriations of over \$125,000,000 for building new roads, adding new tracks to old ones, and buying new rolling stock having just been introduced. Foreign business in rails has grown quieter. The demand for grooved rails continues good and the mills are kept very busy. Similar conditions prevail in respect to light rails for minor roads, the amount of work in hand being considerably greater than in previous years.

Bars and Other Finished Products

Bars remain the most sensitive spot. Prices show a further downward tendency. There is now a marked disposition by producers to go after orders with offers of concessions. An Essen dispatch of this week says that the mills are now unable to get above 118 to 119 marks a ton, delivered at Oberhausen. The great Hoesch concern, of Dortmund, which holds a dominating position in this specialty, is selling at 118 marks, net price at its mills. The net export price is 115 to 116 marks, f. o. b. Antwerp. It must be stated that reports claim that prices are higher than the above. Iron bars are still doing well; the mills are fully employed, and new orders are coming in regularly.

It is not expected now that the efforts to organize a general trade combination for tubes will be successful, some of the concerns having put in impossible allotment claims. The loosely organized convention in these products expires at the end of June, but it appears doubtful whether it will hold till then. Negotiations for the prolongation of the international agreement in tubes, which terminates at the end of this month, are still in progress, but there is reported to be little prospect of the renewal.

The plate trade is feeling the reserved attitude of buyers, but work in hand is so heavy that no curtailment of production may be expected for many months. In ship plates, considerable new orders are mentioned, with good prospects for further business at remoter dates. In medium grades of plates buying is at a slower pace, and in thin plates prices are giving way. Foreign buying is on a smaller scale, and dealers are holding back. Prices range between 137.50 and 140 marks.

New orders in wire rods, both home and foreign, are coming in but slowly. Contracts, however, are being taken out in regular course. Work in wire is still good, but wire nails are not in a satisfactory position, especially for the export trade.

The position of the Belgian trade appears to be somewhat better this week, export orders in rails having checked the downward tendency of prices. The mills have recently received orders for 65,000 tons of rails, 24,000 tons of which are for India and 27,000 tons for Australia.

British Sentiment Now More Hopeful

Not Much Buying of Iron and Steel and Deliveries Exceed Fresh Bookings

(By Cable)

MIDDLESBROUGH, ENGLAND, April 2, 1913.

The Cleveland pig-iron situation is unchanged. The general feeling seems rather more hopeful on better metal and stock markets, but not much buying is reported in the iron and steel trades and deliveries exceed fresh bookings. Semi-finished steel is very dull, with Belgian and French prices easier, but the price named by the German Steel Works Union is unchanged. Stocks of warrant iron are 213,679 tons, against 215,966 tons one week ago. We quote as follows:

Cleveland pig-iron warrants (closing Tuesday), 66s. 9d., against 64s. 10½d., one week ago.

No. 3 Cleveland pig-iron makers' price, f.o.b. Middlesbrough, 67s. 3d., against 65s. 3d., one week ago.

Ferromanganese, £11 12s. 3d. f.o.b. shipping port.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 7s. 6d.

German sheet bars, f.o.b. Antwerp, 112s. 6d.

German 2-in. billets, f.o.b. Antwerp, 107s. 6d.

German basic steel bars, f.o.b. Antwerp, £5 15s., a decline of 1s.

Steel bars, export, f.o.b. Clyde, £8.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £7 7s. 6d.

German joists, f.o.b. Antwerp, £5 12s. to £5 15s.

Steel ship plates, Scotch, delivered local yards, £8 7s. 6d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 15s.

Steel rails, export, f.o.b. works port, £6 15s.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 13s. 10½d., against 14s. one week ago.

Boston

BOSTON, MASS., April 1, 1913.

Old Material.—The market continues to drag, with few transactions of any note. Some material is coming out, but it will require an advance in prices to bring about any important movement of scrap. Prices remain unchanged. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	.....\$11.50 to \$11.75
Low phosphorus steel	.....13.50 to 14.50
Old steel axles	.....14.50 to 15.00
Old iron axles	.....22.50 to 23.00
Mixed, shafting	.....13.50 to 13.75
No. 1 wrought and soft steel	.....10.75 to 11.00
Skeleton (bundled)	.....9.00 to 9.50
Wrought-iron pipe	.....10.00 to 10.25
Cotton ties (bundled)	.....9.50 to 9.75
No. 2 light	.....4.00 to 4.50
Wrought turnings	.....7.50 to 7.75
Cast borings	.....7.50 to 7.75
Machinery, cast	.....13.50 to 14.00
Malleable	.....10.50 to 11.00
Stove plate	.....8.50 to 9.00
Grate bars	.....7.50 to 7.75
Cast-iron carwheels	.....15.00 to 15.50

Buffalo

BUFFALO, N. Y., April 1, 1913.

Pig Iron.—The market is showing a few signs of betterment with more indications of underlying strength than have been noted for some time. An increase in inquiry is reported, particularly from New England, Hudson River and seaboard points. Sales reported for the week aggregate 16,000 to 17,000 tons of foundry grades, with a small amount of malleable, for second and third quarter delivery. A sale is also reported of 8,000 to 10,000 tons of basic for April-June. Fresh inquiry for foundry grades in considerable tonnages has been learned of and there may have been some quiet buying not reported. The furnaces of this district are now pretty well sold up for the near future and well into the third quarter. Producers are in consequence feeling quite indifferent regarding new business. The range of prices is about the same as for some time past, from \$16 to \$17 for the various foundry grades. We quote as follows, f.o.b. Buffalo, for second quarter and last half delivery:

No. 1 foundry	.....\$16.75 to \$17.00
No. 2 X foundry	.....16.50 to 17.00
No. 2 plain	.....16.25 to 16.75
No. 3 foundry	.....16.25 to 16.50
Gray forge	.....16.00 to 16.25
Malleable	.....17.00 to 17.25
Basic	.....17.50 to 18.00
Charcoal, regular brand and analysis	.....18.00 to 19.00
Charcoal, special brand and analysis	.....21.75

Finished Iron and Steel.—The inability of railroads to move material having demoralized deliveries from the Pittsburgh and Youngstown districts has temporarily thrown greater demand on local producers and jobbers and a good deal of business has to be turned down. One interest reports it was obliged to refuse 200 tons of steel bars and 800 tons of plates and shapes for July delivery even at premium prices and 4,000 tons of shapes and plates for delivery in the Fall was unable to find entry on order books. Heavy inquiry for bars and plates is also coming in from Canadian sources. Large inquiry is reported for track supplies for track and bridge repair work. The Lackawanna Steel Company

has taken a contract for 1700 tons of steel sheet piling for the Cleveland & Sons Company, contractors, Brookport, N. Y. Considerable business is developing in twisted bars for concrete construction work, which in many instances has to be substituted for steel frame construction, owing to inability to obtain structural steel by the time required. The International Railway Company's order for 124 lb. girder rails placed with the Lorain mills will aggregate 7500 tons instead of 4500 tons, as reported last week. The railroad company also placed order for 500 tons of 116 lb. girder rails with the same seller. In fabricated structural material business continues to be of large volume. Bids are being taken on the Hippodrome Theater for the Shea Amusement Company requiring 700 tons of steel and figures for the Gaiety Theater for the Columbia Amusement Company taking 300 tons; for the Mark theater at West Ferry and Grant streets, and a theater for the Erie Holding Corporation at Main and Utica streets this city will soon be called for. Bids are in for an addition to the George J. Meyer Company's malting plant and elevator, 200 tons, and bids are to go in April 10 for 1000 tons for rebuilding the water works pumping station, Porter avenue.

Old Material.—Local demand for heavy melting steel has fallen off, also for No. 2 busheling scrap and for old carwheels, and prices in these commodities have declined. A fairly good business has been done in turnings but at lower prices. In No. 1 cast scrap the demand has been quite heavy from local foundries and the price has been well maintained. We quote as follows per gross ton, f.o.b. Buffalo:

Heavy melting steel	.....\$13.00 to \$13.75
Boiler plate, sheared	.....15.00 to 15.50
No. 1 busheling scrap	.....11.50 to 12.00
No. 2 busheling scrap	.....9.00 to 9.50
Low phosphorus steel	.....17.00 to 17.50
Old iron rails	.....15.00 to 15.50
No. 1 railroad wrought	.....14.00 to 14.50
No. 1 railroad and machinery cast scrap	.....13.75 to 14.25
Old steel axles	.....17.50 to 18.00
Old iron axles	.....24.00 to 24.50
Old carwheels	.....15.00 to 15.50
Railroad malleable	.....13.25 to 13.75
Locomotive grate bars	.....10.50 to 11.00
Stove plate (net ton)	.....9.75 to 10.00
Wrought pipe	.....10.00 to 10.50
Wrought iron and soft steel turnings	.....7.75 to 8.25
Clean cast borings	.....7.50 to 8.00
Bundled tin scrap	.....17.00

New York

NEW YORK, April 2, 1913.

Pig-Iron.—More inquiry has come out in the past week, but apart from two or three rather important transactions there is not much buying. Some evidence appears of transactions where the inquiry was not sent out generally. Prices are weaker, but sellers incline to the view that the concessions now reported are such as have sometimes represented the stage intermediate between a period of quiet and the resumption of buying on a considerable scale. Just now there is some piecing-out buying; there are also inquiries for the third quarter, but there has been a certain amount of such inquiry for some time with the result in a good many cases that the inquiry was withdrawn. The largest business reported is 7,000 tons for a New York State concern. Of the 3,500 tons for which one Connecticut buyer recently inquired, about 2,000 tons, has been closed and possibly more. It is understood that 1,000 tons was taken by an eastern Pennsylvania furnace at a price figuring back to less than \$16.50 at furnace for No. 2 X. Another lot of 1,000 tons was Virginia iron which probably netted the furnace less than \$15 for No. 2 X. In the New York district a sale of 500 tons was made for delivery in the second quarter. There has been some Canadian buying from Buffalo furnaces. In that district iron for shipment into Eastern territory has been sold at approximately \$16.25 at furnace. In other cases \$16.50 at Buffalo furnace has been realized for No. 2 X, the range on foundry irons being from \$16 to \$17, according to silicon, and also to some extent according to seller. One important interest with plants in New York State, in Pennsylvania and the South has been considering purchases of 15,000 to 20,000 tons for the third quarter. In another case a large buyer has been sounding the market for second half. An Eastern cast-iron pipe company has bought 4,000 tons of Southern iron on a basis reported to be close to \$12, Birmingham, for gray forge and \$12.25 for No. 3. Sales of basic iron for delivery in New Jersey have been made by two or three producers, the total being estimated at 8,000 to 10,000 tons. The price is understood to have been around \$17 delivered. We

quote as follows for Northern iron at tidewater: No. 1 foundry, \$17.50 to \$18; No. 2 X, \$17.25 to \$17.50; No. 2 plain, \$17 to \$17.25. Southern iron is quoted at \$17.75 to \$18 for No. 1 foundry and \$17.25 to \$17.75 for No. 2.

Structural Material.—New demand contrary to expectations at this time with spring building operations properly impending is surprisingly light, and deliveries have bettered slightly with a softening in price, which, however, needs the closing of a large contract to become definite. Quotations remain at last week's figures and the only premiums are those for shipments in a week or 10 days and there is not much of this sort of business. About the only work of size closed is a Scherzer lift bridge and plate girder spans at Peekskill, about 1000 tons, awarded to the American Bridge Company; 500 tons for the Lehigh Valley over the Lehigh River; 400 tons for an apartment house on East Fifty-first street, given to the Passaic Steel Company, and 200 tons for an apartment house on East Seventieth street, closed with the Belmont Iron Works. The New York Central is asking for bids on two more areas for the terminal work, involving 1500 tons, and the Maine Central is taking bids on 1200 tons for bridge work. Quotations for plain material are: 1.61c. to 1.66c., New York, for mill shipments in the third and fourth quarter; 1.76c., New York, for delivery in three to eight weeks, and for lots from store, 2.15c., New York.

Plates.—The market is quiet. Considerable complaint is made of the tightness of the money market and the consequently high rates expected of railroads, which are accordingly slow to close for cars, although from railroad quarters the claim is made that car builders are asking too high prices. While some types of cars can be delivered in the third quarter, the general futurity of delivery is regarded as a check on heavy purchasing, notwithstanding needs for rolling stock. Deliveries in plates are better, 10 days to two weeks in one case at least, and it is learned that some of the heavy orders placed late in 1912 at 1.60c., Pittsburgh, have not been specified against for much more than one-third the quantity involved. The only car business of size to report is 1500 hopper cars for the Baltimore & Ohio, divided equally among the American Car & Foundry Company, the Pressed Steel Car Company and the Standard Steel Car Company. Quotations remain 1.61c. to 1.66c., New York, for mill shipments in the fourth quarter, and 1.76c. for shipment in three to four weeks with \$1 a ton additional for universal plates.

Bars.—Specifications on contracts show a decreasing tendency, a fact which is not surprising when it is remembered that each month of the last three or four has found the volume of specifications greater than than for the month preceding. It is expected that deliveries will be extended perhaps an average of a week or more, due to the floods. Promising new business is still turned down in some quarters owing to the difficulty of meeting the delivery dates. Bar iron has not strengthened any and a recent sale of about 50 tons for delivery in two weeks was made at 1.52½c. at mill. Notwithstanding, one mill has refused 1500 tons for delivery over three months offered at 1.60c. Steel bars are quoted at 1.56c., New York, for future delivery, three or more months hence, while refined iron bars are held at 1.65c. to 1.80c., New York, with most of the new business at the lower levels. Store prices for steel bars are 2.05c. and for iron bars, 2.10c.

Ferroalloys.—The foreign producers of 80 per cent. ferromanganese early this week reduced their price to \$61, Baltimore, for any delivery, as a direct result of the underselling of material which was bought on speculation during the rise of the market some months ago. Inquiries are few, and some uncertainty is expressed as to whether the cut in price will induce business. In 50 per cent. ferrosilicon there is a quiet but steady demand for moderate-sized lots, namely, \$75, Pittsburgh, for carloads, \$74 for 100 tons and \$73 for 600 tons or over.

Cast-Iron Pipe.—Nothing of importance has developed as to public lettings in this immediate vicinity. Some private buying is going on, with conditions in this class of business about normal for the season. Prices of carload lots of 6 in. range from \$23.50 to \$25 per net ton, tidewater.

Old Material.—Old carwheels are in considerable demand for export. An offer of \$15.25, delivered at lighter's tackle in New York harbor, has been received for 1000 tons. Wrought pipe is in fairly good demand, as this class of scrap is not in as abundant supply as some other kinds of old material. Steel scrap has been quiet in this vicinity, with bids from steel companies in eastern Pennsylvania running from 50c. to \$1 below recent sales. Foundries are quite moderate buyers of

cast scrap. Dealers' quotations are as follows, per gross ton, New York City and vicinity:

Old girder and T rails for melting.....	\$10.75 to \$11.25
Heavy melting steel scrap	10.75 to 11.25
Relaying rails	22.00 to 22.50
Re-rolling rails (nominal)	14.00 to 14.50
Iron car axles	24.00 to 24.50
Old steel car axles	15.75 to 16.25
No. 1 railroad wrought	13.25 to 13.75
Wrought-iron track scrap	12.25 to 12.75
No. 1 yard wrought, long	12.00 to 12.50
No. 1 yard wrought, short	11.00 to 11.50
Light iron (nominal)	4.50 to 5.00
Cast borings	8.00 to 8.50
Wrought turnings	8.25 to 8.75
Wrought pipe	10.75 to 11.25
Old carwheels	14.50 to 15.00
No. 1 heavy cast, broken up	11.25 to 11.75
Stove plate	8.75 to 9.25
Locomotive grate bars	8.00 to 8.50
Malleable cast	11.00 to 11.50

The New York office of A. Milne & Co., importers of Swedish iron and steel, has been removed from 30 Church street to 745 Washington street.

Metal Market

NEW YORK, April 2, 1913.

The Week's Prices

		Cents Per Pound for Early Delivery.					
Copper, New York.		Electro-lytic.	Tin, New York.	Lead, New York.	St. Louis.	Spelter, New York.	St. Louis.
Mar.	Lake.						
27.....	15.00	14.87½	47.75	4.35	4.20	6.05	5.90
28.....	15.12½	14.87½	47.20	4.35	4.20	5.90	5.75
29.....	15.25	15.00	.....	4.35	4.20	5.90	5.75
31.....	15.37½	15.00	47.90	4.35	4.20	5.85	5.70
April							
1.....	15.37½	15.12½	47.75	4.35	4.20	5.90	5.75
2.....	15.37½	15.12½	48.00	4.35	4.20	5.90	5.75

Copper buying has been heavy and prices are higher. Tin has advanced but the market has been quiet. Lead is unchanged. Spelter is lower and dull. Antimony continues inactive at unchanged prices.

New York

Copper.—A much better tone pervades the market. On Friday a buying movement started which continued on Saturday and Monday and it is not yet entirely over. It is definitely known that a very large quantity was taken, with the buying about equally divided between European and American consumers. The deliveries specified were principally for April and May, especially the latter month, and as a result of the activity and previous buying, the supply for these months is largely contracted for. There is a strong feeling that the Balkan situation is practically eliminated as a cause of European uneasiness and consequent restraint of trade. With the good business came higher prices, and Lake copper is quoted to-day at 15.37½c., cash, and electrolytic at 15.12½c., cash, New York, or 15.25c., 30 days delivery, and opinions are that copper prices have touched bottom for the present. The heavy exports which have been noted from week to week continued until the end of March and resulted in a total of 41,702 tons, which is 4000 tons over the previous high record of December, 1911. As previously pointed out, not all of this metal will go into consumption at once, although if the present trend keeps up it will be called for very soon. Quotations in London to-day opened at £67 15s. for spot and £67 17s. 6d. for futures.

Copper Averages.—The Waterbury average for the month of March was 15.12½c. The average New York price for Lake, based on daily quotations in *The Iron Age*, was 15.05c. and 14.90c. for electrolytic.

Pig Tin.—On Friday there was a moderate demand and a little buying resulted; otherwise the market has been extremely quiet. The erratic fluctuations of London prices have caused advances here, but have caused also a lack of confidence to which is attributed the lack of domestic trading. The big feature in tin is the statistics for March as they showed deliveries into consumption of 5900 tons. This figure establishes a new record, the nearest to it having been 5400 tons in April, 1912. The total deliveries for three months of this year show an increase of 1350 tons as compared with the same time last year. The total visible supply on March 31 was 11,132 tons, which is 4832 tons below that of March 31, 1912. Stocks on dock and landing on March 31 were 1767 tons. Arrivals this month so far have been 230 tons and there is afloat 2905 tons. These figures are regarded as a strong showing. There is some doubt as to the ability of consumption to absorb 5900 tons of the metal in one month and it would not be surprising if this month's deliveries fell off considerably as a result of tin having been taken in March to be held in reserve. The New York price to-day is

48c. London opened this morning at £219 15s. for spot and £215 15s. for futures.

Lead.—This metal is unchanged in every particular. It continues dull, with no pressure to sell or anxiety to buy. It is quoted at 4.35c., New York, and 4.20c., St. Louis.

Spelter.—Within the week spelter declined a few points and then strengthened again, but it is low as compared with a week or ten days ago. It is quoted to-day at 5.90c., New York, and 5.75c., St. Louis, and very quiet at these figures. On Friday a drop of several points was caused by the offering of a large quantity at the price quoted.

Antimony.—The market is quiet at unchanged and practically nominal prices—9c. for Cookson's, 8.50c. for Hallett's and 7.62½c. to 7.75c. for Hungarian and Chinese grades.

Old Metals.—The market is firm, with dealers' selling prices unchanged, as follows:

	Cents per lb.
Copper, heavy and crucible	14.25 to 14.50
Copper, heavy and wire	13.75 to 14.00
Copper, light and bottoms	12.75 to 13.00
Brass, heavy	9.25 to 9.50
Brass, light	7.75 to 8.00
Heavy machine composition	12.75 to 13.00
Clean brass turnings	8.50 to 8.75
Composition turnings	11.00 to 12.00
Lead, heavy	4.00
Lead, tea	3.75
Zinc, scrap	5.25

Chicago

MARCH 31.—Interruption of communication localized conditions in the non-ferrous metals to a considerable extent the past week, but such reports as were obtainable indicated an improved situation, with sales aggregating a round tonnage. More recessions in the price of spelter followed a general weakness in this metal, and zinc quotations are also lower. Lead transactions indicated a somewhat firmer feeling in that direction. We quote as follows: Casting copper, 15c.; Lake, 15.50c., in carloads for prompt shipment; small lots, ¼c. to ¾c. higher; pig tin, carloads, 48.50c.; small lots, 50.50c.; lead, desilverized, 4.30c. to 4.35c. for 50-ton lots; corroding, 4.55c. to 4.60c. for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.90c.; Cookson's antimony, 10.50c., and other grades, 9.75c., in small lots; sheet zinc is \$8, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 13c.; copper bottoms, 11.75c.; copper clips, 12.75c.; red brass, 12c.; yellow brass, 9c.; lead pipe, 3.80c.; zinc, 4.35c.; pewter, No. 1, 33c.; tinfoil 39c.; block tin pipe, 44c.

St. Louis

MARCH 31.—The week has been somewhat quiet. Spelter is sharply lower. Quotations to-day stand as follows: Lead, 4.22½c. to 4.25c.; spelter, 5.70c.; tin, 48.35c.; Lake copper, 15.47½c.; electrolytic copper, 15.35c. to 15.47½c.; antimony, Cookson's, 9.35c. In the Joplin ore market the past week a slump carried prices down and the highest figure realized for zinc blende was \$49 per ton, on a basis of \$46 for 60 per cent. The basis figure ranged down to \$40. The return of the Edgar Zinc Company to the market was encouraging, this company having been out for several weeks. The bulk of the ores sold at \$44 to \$45. On low-grade ores of the Webb City district sales were made as low as \$30 where the iron affected the quality. Calamine ore was weak at \$21 for 40 per cent., with the choicest bringing no more than \$25. Lead ore was unchanged at \$53.50 to \$54. On miscellaneous scrap metals we quote as follows: Light brass, 5.50c.; heavy brass and light copper, 9c.; heavy copper and copper wire, 11c.; pewter, 25c.; tinfoil, 34c.; zinc, 4c.; lead, 3.50c.; tea lead, 3c.

F. D. Mitchell, secretary American Supply and Machinery Manufacturers' Association, on March 29 announced the receipt of a telegram from N. A. Gladding, Indianapolis, president of the association, stating that the joint convention of the supply and machinery dealers, which includes the National Supply and Machinery Dealers' Association and the Southern Supply and Machinery Dealers' Association, would be held April 10, 11 and 12 regardless of the damage done in Indianapolis, the convention city, and throughout the Central West. Mr. Mitchell in his announcement asked members to adhere to the arrangements they had made or to make them quickly if they had not done so.

Iron and Industrial Stocks

NEW YORK, April 2, 1913.

Steady recovery has characterized the course of the stock market since last week's report. The fall of Adrianople, the Turkish acceptance of peace overtures and the better condition in financial circles have operated to bring about an improved feeling which immediately influenced the values of securities. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Am. Can. com.	30¾-34¾	Nat. En. & St. com.	14¾-15
Am. Can. pref.	96½-122¾	Pressed Steel, com.	26½-28½
Am. Car & Fdy. com.	50¾-52	Pressed Steel, pref.	97
Am. Car & Fdy. pref.	114-114½	Railway Spring, com.	32-32½
Am. Loco. com.	36¾-39	Railway Spring, pref.	99
Am. Loco. pref.	105¼-106	Republic, com.	25½-27½
Am. Steel Foundries	33¾-36½	Republic, pref.	85½-86½
Bald. Loco. com.	47¼-48	Rumely Co. com.	41-44
Bald. Loco. pref.	100¾-104	Rumely Co. pref.	83-84½
Beth. Steel, com.	34¾-37¾	Sloss, com.	35¾-36¾
Beth. Steel, pref.	69½-72	Pipe, com.	14-15
Case (J. L.) Co. pref.	100¾	U. S. Steel, com.	52-52½
Colorado Fuel	33¾-36¾	U. S. Steel, com.	60¼-63¼
Deere & Co. pref.	97¾-98¼	U. S. Steel, pref.	107¾-108¾
Emer-Brant, com.	45	Va. I. C. & Coke	50
General Electric	137-140¾	Westinghouse Elec.	62½-67
Gr. N. Ore Cert.	34-37	Am. Ship, pref.	100¼
Int. Harv. com.	107-109	Chic. Pneu. Tool	49½-50
Int. Harv. new	105-107½	Cambria Steel	50-51½
Int. Harv. new, pref.	112½	Lake Sup. Corp.	27¼-29¼
Int. Harv. pref.	111½-112½	Pa. Steel, pref.	85¾-89¼
Int. Harv. Corp.	105-107¾	Warwick	10½-11
Int. Harv. Corp. pref.	112½	Crucible Steel, com.	14¾-15¼
Int. Pump, com.	10¾-10½	Crucible Steel, pref.	91-92
Int. Pump, pref.	37	Harb. Wk. Ref., pref.	100-100¼
Lackawanna Steel	38-44½	La Belle Iron, pref.	122-123

*Less dividend of \$25.75.

Dividends Declared

The Westinghouse Electric & Mfg. Company, regular quarterly, 1¾ per cent. on the preferred stock, payable April 15, and regular quarterly, 1 per cent. on the common stock, payable April 30.

The Nova Scotia Steel & Coal Company, Ltd., regular quarterly, 2 per cent. on the preferred and 1½ per cent. on the common stock, payable April 15.

The American Locomotive Company, regular quarterly, 1¾ per cent. on the preferred stock, payable April 21.

The Eastern Steel Company, quarterly, 1¾ per cent. on the first preferred stock, payable April 30.

The Chicago Pneumatic Tool Company, regular quarterly, 1 per cent. payable April 25.

The American Screw Company, regular quarterly, 2½ per cent., payable March 31.

The Rhode Island Perkins Horseshoe Company, regular quarterly, 1 per cent. on the preferred stock, payable April 15.

The Western Electric Company, regular quarterly, 2 per cent., payable April 15.

Motor Trucks at Baldwin Locomotive Works.—A fleet of ten 5-ton Saurer trucks is used by the Baldwin Locomotive Works to operate between the Philadelphia and Eddystone plants of the company, 13 miles apart. Each truck makes two round trips every 12 hr. night and day—52 miles plus several miles of travel around the plants getting and discharging loads, making an average of perhaps 60 miles. The trucks are loaded going and coming, generally to capacity, 10,000 lb., making the haul of each truck about 80,000 lb. in 24 hr. It cost the company, according to its own figures, \$12 per truck per 12-hr. day, and figuring 60 miles per 12-hr. day gives a unit cost of 4 cents per ton mile. Recently one of the trucks was used to transport a small commercial locomotive from one plant to the other, although it weighed more than the truck was supposed to carry. The trucks are sometimes used to move one, two or three freight cars when no switch engine is available at the moment.

Another large hot water heater has been learned of. Frank L. Patterson & Co., manufacturers of the Berryman type of heater, 26 Cortlandt street, New York City, constructed some time ago on specifications of Marks & Woodwell, consulting engineers, New York, for use at Shelton, Conn., a heater 8 x 15 ft. in size, to handle 267,000 lb. of water per hour. Some years ago they built for the same plant a 6 x 14-ft. copper-lined hot-water heater.

Personal

John W. Gray, formerly superintendent of machinery of the Newport News Shipbuilding & Dry Dock Company, Newport News, Va., has recently been made assistant to the general manager.

Heinrich Koppers, president of the H. Koppers Company, Chicago, on one of his frequent trips to this country, has been in Chicago the past week.

Clarence Williamson, assistant treasurer of Joseph T. Ryerson & Son, Chicago, has retired from active service owing to ill health. Mr. Williamson, who had previously been connected with W. S. Mallory & Co., became associated with Joseph T. Ryerson & Son in 1891, when his firm was absorbed. He was made assistant treasurer in 1904. He has been succeeded by E. L. Hartig.

George Westinghouse has been re-elected president of the Union Switch & Signal Company, Pittsburgh, and the retiring directors were also re-elected.

F. D. Canfield, Jr., vice-president Fulton Iron Works, St. Louis, Mo., has returned from a four months' trip in South America.

W. O. Duntley, president Chicago Pneumatic Tool Company, Chicago, sailed for Europe April 2.

Henry B. Lupton, vice-president Oliver Iron & Steel Company, who has been in the South for some time on account of illness, is rapidly regaining his health and is now located at Hampton Terrace Hotel, Augusta, Ga. He expects to be able to return to Pittsburgh and resume his duties about May 1.

Robert A. Bole, Pittsburgh manager of Manning, Maxwell & Moore, Inc., has sailed for the West Indies and Panama.

Charles Robbins, who since 1909 has been manager of the industrial and power department of the Westinghouse Electric & Mfg. Company, has been appointed assistant sales manager, with headquarters at East Pittsburgh, Pa. J. M. Curtin, formerly assistant manager of the industrial and power department, has been appointed manager to succeed Mr. Robbins.

Henry Vogt, president Henry Vogt Machine Company, Louisville, Ky., has been elected a member of the Louisville Rotary Club, which includes not more than one man from any line of industry. Mr. Vogt is to represent boiler manufacturers.

At Pittsburgh last week Andrew W. and Richard B. Mellon, bankers and also interested in large manufacturing enterprises, announced a gift of \$450,000 to the University of Pittsburgh to establish the Institute of Industrial Research and School of Specific Industries. The new school will be the first of its kind in the United States and will be under the direction of Dr. Robert Kennedy Duncan.

John H. Hall, author of the article on manganese steel which appeared in *The Iron Age* of March 20, was referred to as connected with the Taylor-Wharton Iron & Steel Company. Mr. Hall is consulting engineer for that company, but is no longer in its employ, being engaged in general practice as a consulting engineer, with offices at 165 Broadway, New York.

Charles A. Lindstrom, formerly chief engineer of the Pressed Steel Car Company, has been appointed assistant to president, with headquarters in the Farmers' Bank Building, Pittsburgh, Pa. B. D. Lockwood, formerly assistant chief engineer, has been appointed chief engineer. J. F. Streib, formerly mechanical engineer, has been appointed assistant chief engineer. Felix Koch has been appointed mechanical engineer. These changes were all effective April 1.

John C. Jay, Jr., who has been acting general manager of sales of the Pennsylvania Steel Company and Maryland Steel Company since August, 1912, was elected general manager of sales of the two companies at the recent annual meeting of directors.

The Big Four Railroad, it is announced, has provided a school in the shops at Mount Carmel, Ill., for the training of apprentices for more effective work in the shops. Instructors have been provided and the time of apprentices utilized in the school will be accounted a part of their working time in accrediting them for their wages. Graduation from the school will be required as a necessity in graduation from apprenticeship.

Obituary

GEORGE Y. WILLIAMS, who for many years has been Eastern sales manager, with headquarters in New York City, for the Lisk Mfg. Company, Canandaigua, N. Y., and the Rochester Stamping Company, Rochester, N. Y., died at his home in Brooklyn, N. Y., March 16 after a short illness, aged 61 years. He had a wide acquaintance among jobbers and dealers in sheet metal products throughout the country.

Cutting Speeds and Bearing Pressures

Cutting speeds with steel were referred to by E. P. Bullard, Jr., president Bullard Machine Tool Company, Bridgeport, Conn., in the discussion succeeding his paper on "The New Era in Machine Tool Design," presented before the Cleveland Engineering Society on November 26, 1912. A large portion of the paper itself was printed in *The Iron Age* of December 12 last year, but the discussion has now become available in the Journal of the Society.

Mr. Bullard mentioned a cut taken on steel, said to be 0.40 per cent. carbon. The chips came off red, the speed was over 400 ft. per minute and the material cut like wood. "I have frequently seen in our own shop," he said, "speeds of 300 ft. on finishing cuts preparatory to grinding. The turning of steel castings is, of course, a more difficult problem, but speeds of 65, 70, 80 and 90 ft. per minute are possible."

In reply to a question regarding the limits of pressure per unit of area which he allows in bearings, Mr. Bullard said: "We may try to keep within 25 lb. per sq. in. with a maximum of 50 lb. We may sometimes run over that on account of the difficulty of calculating pressure. The ordinary boring machine of our design is probably running at less than 10 lb. per sq. in. We try to maintain very low pressure, but that is possible in machine tools which would not always be possible with other machines."

A Malleable Iron Record

One of the open-hearth furnaces in the plant of the Pennsylvania Malleable Iron Company at McKees Rocks, Pa., an identified interest of the Pressed Steel Car Company, has made a remarkable record in the melting of malleable iron. C. H. Gale, superintendent of foundries of the company, furnishes a statement of the performance of this furnace up to and including Saturday, March 29, as follows: The furnace was placed in operation September 27, 1909, after being given general repairs, consisting of new roof, bottom, etc., and was run continuously on malleable iron with the exception of a shutdown of three days, commencing July 2, 1911, for cleaning checkers, up to which time it made 992 heats, and up to November 2, 1912, it made 1792 heats with a total output of 26,880 tons. The furnace was then stopped for partial repairs, consisting of new ports, jambs, checkers, etc., and was again put in operation November 25, 1912, with the old bottom and roof. On March 29 the 210th heat was melted on the new run and the furnace is reported in good condition.

The following speakers are announced for the banquet at the annual convention of the National Metal Trades Association at Hotel Astor, New York City, April 9 and 10: Charles Nagel, Secretary of Commerce and Labor in President Taft's cabinet; W. L. Makenzie-King, Canadian Minister of Labor and Commerce; Charles W. Miller, United States district attorney, Indianapolis, Ind., and Rev. Dr. W. W. Giles, Newark, N. J. In addition to the programme as published in *The Iron Age* of last week an address will be given during the convention by James W. Bryce, manager of the Square Deal Magazine, on "What's The Matter With the U. S. A.?"

The Manufacturers' Association, Bridgeport, Conn., held its fifth annual banquet at the Stratford Hotel, March 25, with a large and representative attendance of the manufacturers of Bridgeport and other Connecticut industrial centers. F. C. Blanchard, Ashcroft Valve Company, presided, and among the speakers were President Richard MacLaurin of the Massachusetts Institute of Technology, Dr. Lee S. McCollister, dean of the Crane Theological School of Tufts College, Rev. Ernest J. Croft and Mayor Clifford B. Wilson, Bridgeport.

Pittsburgh and Vicinity Notes

Press reports that the National Tube Company, Pittsburgh, will completely rebuild its Pennsylvania works in that city and double its capacity, are greatly exaggerated. The proposed improvements comprise the replacement of a number of worn-out threading machines, an increase in the number of machines, some additions to the coupling shop, an addition to one of the mill buildings, extensions to the telfer system, emergency hospital, etc.

The Carnegie Steel Company is arranging for the installation of an additional 16-in. mill in its works at Mingo, Ohio, and is asking for prices on a 1600-hp. engine.

The Harbison-Walker Refractories Company, Pittsburgh, announces a general advance in wages at all its plants from April 1, which will affect about 4000 men.

The report that the McKeesport Tin Plate Company, McKeesport, Pa., will erect more hot tin mills is incorrect, probably arising from the fact that the company is in the market for two 30 x 60-in. heavy duty Corliss engines to replace engines long used, but not heavy enough.

The Buckeye Engine Company, Salem, Ohio, has appointed the Federal Engineering Company, 1112-1118 House Building, Pittsburgh, sales agent for the Pittsburgh district for its full line of steam and gas engines and other products, effective April 1.

The Latrobe Electric Steel Company, recently organized at Latrobe, Pa., will install a 5-ton Heroult electric furnace and will use power furnished by the West Penn Traction Company. The plant will have a complete foundry and a large steam hammer to forge castings and ingots into commercial shapes. The company will be in the market for considerable equipment. The officers' names were mentioned in *The Iron Age* of March 20. The vice-president, Charles W. Gutzzeit, was formerly connected with the Taylor Iron & Steel Company, High Bridge, N. J.

The La Belle Iron Works, Steubenville, Ohio, which is building a new open-hearth furnace, expects to have it completed in about 60 days.

The Simonds Mfg. Company, Pittsburgh, manufacturer of gears and special machines, is adding a third story to its building, 75 x 100 ft., in which new equipment will be installed and its capacity increased about 50 per cent.

The Keystone Driller Company, Beaver Falls, Pa., has asked for bids on the erection of a new building of brick and steel frame, saw tooth construction, 60 x 360 ft.

Ernest G. Schmeisser, 1009 Hartje Building, Pittsburgh, is local representative of the Wiener Machinery Company, 50 Church Street, New York.

The Ingersoll-Rand Company, New York City, has placed with Tate-Jones & Co., Inc., Pittsburgh, an order for 29 oil-burning furnaces for its plant at Phillipsburg, N. J., to be used for heat treating and forging.

The Orenstein-Arthur Koppel Company has removed its general offices to Koppel, Beaver County, Pa. The Pittsburgh sales department will retain its present offices in the Machesney Building, Pittsburgh.

The strike at the plant of the Oliver Iron & Steel Company, Pittsburgh, is still unsettled and the entire works is now shut down, partly on account of the strike and partly because of the flood. Negotiations are under way looking to a settlement of the labor troubles, which may be adjusted in a short time.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, has received an order from the West Penn Traction & Water Power Company for two 19,000-kva Westinghouse-Parsons turbo-alternators. These will be the largest generating units in the Pittsburgh district. The West Penn Company, named above, recently took over the Wheeling Traction Company, Wheeling, W. Va., and expects to make extensive improvements in the power houses at Wheeling and at Connellsville and in its distribution lines. The two power houses mentioned, in connection with the water-power development at Cheat Haven, W. Va., will form one of the largest electric systems in the country.

It is announced that the Model Gas Engine Works, now located at Peru, Ind., will be removed to Pittsburgh. The company has bought four acres of ground fronting

on the Pennsylvania Railroad at Homewood near Pittsburgh, on which the plant will be built.

The West Leechburg Steel Company, Pittsburgh, manufacturer of cold-rolled strip steel, has started a second open-hearth furnace in its plant at West Leechburg, Pa.

Charcoal for California Electric Smelting

The charcoal used in connection with the electric smelting of iron ores at Heroult, Cal., according to John H. Lewis, state engineer of Oregon, in his annual report, is obtained as a by-product from the wood distillation industry, which is run in connection with the iron plant. The charcoal is obtained by running cord wood on cars into a steel cylinder 5 ft. in diameter and 20 ft. long, mounted horizontally in a brickwork inclosure. The cylinder is heated to a high temperature, using crude oil, after the door has been closed and sealed. The heat dries out all volatile acids and oils, leaving charcoal as a residue. The resulting oils and acids are conveyed through a pipe to a tank and are later refined, producing wood alcohol, acetic acid, wood oil, turpentine, creosote and finally acetate of lime. The report also mentions that pig iron has been produced at Heroult in an experimental electric furnace at a cost of \$15 per ton, and was delivered at San Francisco at a cost of \$18, ordinary pig iron selling at \$23 to \$26.

Changes in Bethlehem Steel Company

It was announced at the Bethlehem Steel Company at Bethlehem, Pa., April 1 that C. M. Schwab had been made chairman of the board and that E. G. Grace had been made president of the company. Archibald Johnston has been made first vice-president of the Bethlehem Steel Corporation and H. S. Snyder second vice-president. C. A. Buck has been made a vice-president of the Bethlehem Steel Company. Mr. Schwab said he recently purchased the Titusville Forge Company for \$500,000.

The Chamber of Commerce of the United States of America, Washington, D. C., announces that the Eastern Supply Association and the American Supply and Machinery Manufacturers' Association have become members of that organization. The Central Supply Association, the National Federation of Retail Implement and Vehicle Dealers' Association, the National Founders' Association, the National Implement and Vehicle Association of the United States, the National Machine Tool Builders' Association and the Southern Hardware Jobbers' Association were already members. In less than a year the Chamber of Commerce of the United States of America has brought into co-operation 309 organizations, 85 of which are National or State in scope.

Steel manufacturers of the Pittsburgh district are taking lively interest in the coming Automobile Show to be conducted under the auspices of the Automobile Dealers' Association of Pittsburgh, Inc., represented by its show committee, whose offices are at 112 North Beatty street. This show is the seventh held by the association and is expected to make a new record of achievement. It opens on Saturday evening, April 5, and runs continuously until Saturday, April 19. The first week will be devoted to pleasure cars and the latter part to commercial vehicles. The exhibition place is new, the association having taken over the East Liberty Market House, and the work of transforming the interior has practically been completed.

At Buffalo, April 2, on application of H. J. Hillman, Son & Co., Pittsburgh, United States Judge Hazel appointed F. Ernest Porter and Alfred L. Becker receivers for the New York State Steel Company, with instructions to continue operation of the plant. The company expects in this way to work out of its financial difficulties.

The Laclede Gas Company, St. Louis, Mo., which has decided upon the construction of a large by-product coke plant at the southern end of the city, will use the Otto-Hoffman system.

Iron and Steel Output Cut Down by Floods

An Unparalleled Interruption of Operations in Central Western Districts— Coke Shipments Now Being Resumed

It is still impossible to make any close appraisal of the loss to the iron industry caused by the unprecedented floods of last week. Always when such calamities come upon the country there is exaggeration of the loss both of life and of property. In the past week various estimates have been made of the curtailment of production of pig-iron and steel products, and some of them have been far above reasonable figures—notably one published in several financial papers putting it at "1,000,000 tons of pig iron, 800,000 tons of crude steel and 500,000 tons of finished products, of a total value of \$45,000,000."

Actual destruction of iron and steel works property has been relatively small. In only two cases are blast furnaces reported chilled, and there have not been any explosions due to water reaching the crucible. At Sharon and Youngstown water flooded the hot checker work of open-hearth furnaces, with serious damage at two plants. There has been considerable damage to machinery, no doubt; but it is chiefly of the sort that can be repaired in a few days once the water subsides.

Coke embargoes by the railroads have been the chief embarrassment of the blast furnaces since the partial subsidence of the water; but this interruption will not be as serious as has been indicated in some published statements. On Monday of this week coke shipments were resumed to furnaces in the Mahoning and Shenango valleys and are likely to be nearly normal in many cases by the latter part of this week.

The largest number of blast furnaces banked at one time was about 55, of which 32 belonged to United States Steel Corporation subsidiaries. An average of 10 days' idleness is probably a high estimate, considering that a good many of the affected furnaces resumed in four or five days. The loss of pig-iron production, on this basis, allowing for reduced output after resumption, is probably well covered by an estimate of 250,000 to 300,000 tons. The reduction of steel works output may be more than this, from first to last, owing to the more serious damage to rolling mill equipment and the holding up of converters and open-hearth furnaces because finishing mills are not ready to start, also in a few cases the damage to steel furnaces themselves.

Shutdowns of Important Iron and Steel Plants

The whole nation has been oppressed by the news that for ten days has filled the daily press, of appalling loss of life and destruction of property in Ohio and portions of Indiana. At the same time the districts in which are located some of the most important iron and steel works of the country have been visited by the most disastrous floods they have ever known, measured by loss of property and interruption to the operation of manufacturing plants. In the western part of Pennsylvania (apart from Pittsburgh), eastern Ohio and West Virginia the floods almost paralyzed operations at blast furnaces, steel works, rolling mills and other manufacturing plants. The Mahoning and Shenango Valleys and the Wheeling district suffered most. In the Pittsburgh district the damage was light as compared with points further west, and at this writing (Tuesday, April 1) all the affected works in Pittsburgh have already started, or are preparing to do so. It will be weeks, however, before some of the flooded works will be in as good physical shape as they were before. The high water deposited mud and debris in the mills and about furnaces, and until this has been cleared away the actual damage cannot be estimated. At Pittsburgh, the Monongahela River rose to a height of 26 ft. and the Allegheny to 30.4 ft. These two rivers join at what is known as "the Point" in Pittsburgh and form the Ohio River. The latter rose to a height of over 50 ft. at Wheeling and other lower river points, and did a vast amount of damage. The United States Steel Corporation through its affiliated interests, was the heaviest sufferer, having many plants in the flooded districts. The Carnegie Steel Company reports that its plants in the Pittsburgh and Mahoning and Shenango valley districts were affected as follows:

Carnegie Steel Company

In Pittsburgh only four blast furnaces of the Carnegie company were shut down, the two Lucy and two of the three Isabella furnaces, the other Isabella furnace having been idle for repairs. The two Lucy and the two Isabella furnaces were off about five days and lost a total of about 7000 tons of product. The Carnegie company has five

finishing mills in the Pittsburgh district, these being the Upper and Lower Union, Clark, McCutcheon and Painter works. All these except the Painter works were down for four or five days, and the cutting down of finished output was considerable. The Edgar Thomson, Homestead, Duquesne and Clairton works of the Carnegie company were not affected by the high water.

In the New Castle, Pa., district, the Carnegie company was a heavy loser, as all the four blast furnaces at New Castle and also the steel works there were down, the Shenango River rising to the greatest height ever known. Two of the idle stacks at New Castle were started on Sunday, March 30, and the other two on Monday, March 31. Shipments of billets and sheet bars from this plant will be seriously interfered with for some time, as a railroad bridge was swept away over which much of the product was formerly shipped. At North Sharon, Pa., the blast furnace and open-hearth steel works were down for four or five days and also the finishing mills. The blast furnace and steel works were started on Monday and Tuesday, and it is hoped to have the finishing mills on full this week. At South Sharon, the two blast furnaces and two finishing mills were off for four days, but are now running. The Greenville, Pa., mills of the Carnegie company were not affected.

At Youngstown, Ohio, four of the blast furnaces of the Ohio Works were off four days, a loss of about 8000 tons of pig iron, and the other two stacks were kept running slow, making about 250 tons per day each, or half their usual output. On Monday, March 31, three of the four idle stacks were put in blast and the other stack was scheduled to start on Tuesday. The Union mills and the Upper and Lower mills of the Carnegie company, at Youngstown, were down four days. The Niles blast furnace at Niles, Ohio, was banked four days, a loss of about 1000 tons of metal, while at Columbus, Ohio, the two blast furnaces and the Bessemer steel works and finishing mills were off for five days, though they are expected to get started this week.

At Mingo Junction, Ohio, all the blast furnaces and the Bessemer steel works were closed four or five days, and the same is true of the three blast furnaces and the

Bessemer steel works at Bellaire, Ohio. The blast furnaces at Mingo and Bellaire are being started as fast as possible, but the steel works at these two places are still idle.

This completes the list of blast furnaces, steel works and finishing mills of the Carnegie company that were put out of commission by the flood, and while the damage to the plants has been heavy, the greater damage will be from the loss of pig iron and steel from the different plants, which is so badly needed at present.

National Tube Company

In the Pittsburgh district the Pennsylvania and Continental works of the National Tube Company were closed down by the high water on Thursday, March 27. The Pennsylvania works started in part on Wednesday, April 2, and the Continental works on Tuesday, April 1. The loss of output at the Pennsylvania works was about 4000 tons, and at the Continental works about 1500 tons. At the Riverside works of this company at Wheeling, W. Va., the two blast furnaces, steel works, skelp mills and pipe mills were shut down on Thursday, March 27, and will not start until Monday, April 7. The water at one of the blast furnaces was 3 ft. over the tapping hole. The stoppage at the Lorain, Ohio, works was comparatively slight, all the four furnaces continuing in operation, but the large blooming mill was off three and one-half days, the water having worked into the soaking pits. The other plants of the National Tube Company, including the McKeesport works at McKeesport, Pa., the Republic works, Pittsburgh, and the Ellwood City works, Ellwood City, Pa., were not affected.

American Steel & Wire Company

The greatest loss to this company was at Farrell, Pa., its rod, wire and wire nail mills being off for about six days, with a loss of output of about 500 tons per day. The two Shoenberger furnaces, Bessemer steel works, finishing mills and horseshoe factory in the Pittsburgh district were shut down by the high water, but are expected to start in the latter part of this week. The Rankin works, at Rankin, Pa., consisting of rod, wire and wire nail mills were off for four days, but are now in full operation. The other Pittsburgh district plants, consisting of the Donora works at Donora, Pa., and Braddock works at Braddock, Pa., were not affected. At Cleveland the four Central furnaces had to be banked because of the highest water ever known in the Cuyahoga River. These furnaces again had blast on this week and the Newburgh works were in full operation. It was expected that the Cuyahoga works would be started up later in the week.

American Sheet & Tin Plate Company

The sheet and tin plate plants of this company are pretty widely scattered through Western Pennsylvania and Western Ohio. The heaviest damage was done to the works located in the New Castle, Pa., district. The tin plate mills affected by the flood, and which were put out of commission were the Pittsburgh works at New Kensington, Pa., containing 8 hot mills; Laughlin works at Martin's Ferry, Ohio, 23 hot mills; Sharon works, Sharon, Pa., 20 mills; New Castle works, 20 mills; Shenango works, 30 mills, both the last-named being at New Castle, Pa.—or a total of 101 mills. The company was operating on Monday, March 31, seven tin mill plants containing 73 hot mills, so that its operations were down to nearly 40 per cent. of capacity. The sheet mills closed by the flood included Canal Dover works at Canal Dover, Ohio, 11 hot mills; Mercer works, Sharon, Pa., 5 hot mills; Wellsville works, Wellsville, Ohio, 10 mills; W. Dewees Wood works at McKeesport, 13 mills, and Guernsey works at Cambridge, Ohio, 11 mills—making a total of 62 hot mills, while the company is operating five others not affected by the flood, containing 71 hot mills. This is aside from the Gary, Ind., plant, which has 15 hot mills in operation. The water has entirely gone down from these idle sheet and tin mills, and they are being rapidly cleaned up, but the scarcity in supply of coal and of sheet bars

to operate them is serious and they may be considerably delayed in starting.

American Bridge Company

The Ambridge works at Ambridge, Pa., located directly on the Ohio River, and having a capacity of about 15,000 tons of fabricated material per month, was closed for three days, so that the loss of output was about 1500 tons. The plant is again in full operation.

Youngstown Sheet & Tube Company

The four blast furnaces, Bessemer steel works, pipe mills, sheet mills and other manufacturing plants of this company at Youngstown, Ohio, and its rod, wire and wire nail mills at Haselton, Ohio, were shut down for four or five days, mainly because high water prevented the men from getting to and from the mills. The works themselves were not submerged, but approaches are bad, and on account of the Mahoning River being so high, egress and ingress were prevented. The water started to go down rapidly on Friday, March 28, and the company expected to have everything running full again by Wednesday or Thursday this week. The actual damage to its plants was light compared with others in the Youngstown district.

Republic Iron & Steel Company

In the latter part of last week not a wheel turned in any of the plants of this company in the Youngstown, Ohio, district. Hannah blast furnace had been blown out some time ago for repairs, but the four other stacks were banked and the Bessemer steel works and finishing mills in Youngstown proper were down and a great deal of damage was done to machinery. This was also the case with the open-hearth works and pipe mills at Lansingville, also the Brown-Bonnell and the Mahoning Valley works in Youngstown, Ohio. The company expects to start its Bessemer steel works and the Brown-Bonnell and Mahoning works on Thursday or Friday this week, and probably two or three of the blast furnaces, but the open-hearth steel works and pipe mills at Lansingville will not go on before next week.

At Other Valley Works

Also in the Youngstown district, the Youngstown Iron & Steel Company, manufacturers of black and galvanized sheets, were down four or five days and smaller plants, such as the Youngstown Car Mfg. Company and the Falcon Bronze Company were off for about the same time. The flood in the Youngstown district was the worst ever known, the Mahoning River and tributary streams reaching the highest stages in their history. It will probably be a week or two before all the manufacturing plants are in operation again, and it may be a good deal longer before they can operate full on account of the delays that will come in supply of coal and coke.

In the Shenango Valley the Sharon Steel Hoop Company plant, Sharon, Pa., was submerged and was out of commission for about a week. This plant contains an open-hearth steel works, hoop and cotton tie and other finishing mills, and will probably be in partial operation by the last of this week.

At Sharpsville, Pa., the Shenango Furnace Company had one furnace banked, being unable to get coke, but the other two stacks were kept in operation. Alice furnace of the Valley Mold & Foundry Company was banked for want of coke, while the blast furnace of the Stewart Iron Company at Sharon, Pa., was surrounded by water and badly damaged. At Struthers, Ohio, the furnace of the Struthers Furnace Company was banked on Monday of last week. There was three feet of water in the stoves and the motors and dynamos were all under water. The Pittsburgh & Lake Erie (New York Central Lines) bridge at Struthers was carried away, though it was loaded down with hopper cars, and the center pier is gone. Pennsylvania Railroad trains are running into the town this week, however, and coke being again available, Struthers furnace was started up on Tuesday. Ella furnace of Pickands, Mather & Co., at West Middlesex, Pa., was out of com-

mission because of the high water, but is expected to start again as soon as coke can be secured.

It is stated that 22 blast furnaces in the Mahoning and Shenango valleys were banked either on account of inability to get coke, or because of the high water. It is probable that with the exception of two these stacks will all be in operation again by the middle or latter part of this week.

At Wheeling, W. Va., the three blast furnaces of the Wheeling Steel & Iron Company, also its Bessemer steel works, puddling mills, pipe and plate mills were down four or five days on account of the flood. The company expects to have everything running again in the latter part of this week.

The Coke Situation

Reports of a general embargo on coke routed for the two valleys were incorrect. The Pennsylvania Lines West, the Pittsburgh & Lake Erie and the Baltimore & Ohio are the three leading railroads that serve the two valleys, and of the three only the Pennsylvania Lines West declared an embargo on coke for shipment west and north. The Pittsburgh & Lake Erie and the Baltimore & Ohio lines into the two valleys are open, but service is crippled by reason of washouts, over which temporary tracks have been laid, as well as by the loss of one or two bridges, and the movement of trains will necessarily be slow for some time. On Monday, March 31, only four or five blast furnaces in the two valleys would accept coke, all the others either being banked or having enough coke on hand to run them three or four days or longer. It will probably be two weeks or more before there is a free movement of coke to the valleys, and it may be fully as long before all the furnaces affected by the floods are in good running order again.

There will be great trouble for several weeks at finishing plants, such as sheet and tin-plate mills, in getting a full supply of steel, as all the steel works in the Mahoning and Shenango valleys and Wheeling district, Mingo, Bellaire and Columbus were out of commission on account of the floods and will not be back to normal condition for some time. Output will be restricted and movement of freight by the railroads will necessarily be slow. The floods have done an enormous amount of damage to manufacturing plants in the districts referred to above, and output of pig iron, steel and finished materials will be more or less restricted for some little time.

Later Developments in the Mahoning and Shenango Valleys

PITTSBURGH, April 1, 1913.—The flooded blast furnaces, steel mills and other manufacturing plants in the Mahoning and Shenango valleys are slowly getting started, and it is expected by the end of this week they will all be on practically full. Two blast furnaces of the Youngstown Sheet & Tube Company went on Sunday night, and the third stack on Tuesday. Nearly all the company's finishing mills are now running but not to full capacity. The Republic Iron & Steel Company has already started four of its finishing mills. No. 2 blast furnace at Haselton started Sunday night and No. 3 on Tuesday. The Bessemer steel plant at Youngstown was scheduled to start on Thursday, April 3, but may not get on for a day or two later. The open-hearth plant, pipe and plate mills at Lansingville, just outside of Youngstown, and which were badly flooded, will all be on the latter part of this week, though some repairs to a few open-hearth furnaces may be required. No. 1 blast furnace at Haselton will be rebuilt before it is blown in again, as it was the intention of the company to blow the furnace out shortly for relining and repairs. Hannah furnace of the company, which has been out five or six weeks for repairs and relining, will be ready to start about April 10. All the blast furnaces, Bessemer and open-hearth steel works and finishing mills of the Carnegie Steel Company in the Youngstown district are again in operation.

In the Shenango Valley, the plants shut down by the flood are all going again, but not to full capacity as some of the finishing mills cannot get steel. The Sharon Steel Hoop Company lost three of its open-hearth furnaces which were flooded before the heats could be drawn. The Atlantic furnace of the Republic Iron & Steel Company at New Castle and its Hall furnace at Sharon, both banked on account of the flood, are running again. Coke is being moved by the railroads fairly promptly and it is believed that within three or four days will be moving on regular schedule. The amount of damage done by the floods and the loss of life in both the Mahoning and Shenango valleys were greatly over-estimated in the daily press. In the Wheeling district, some of the plants shut down on account of the flood are again in operation but are not running full.

The two blast furnaces, open-hearth steel plant containing eleven 60-ton furnaces, plate, pipe and sheet mills of the La Belle Iron Works at Steubenville, Ohio, and also the cut nail factory of the company at Wheeling, W. Va., were flooded and lost about four days. Both blast furnaces are on again and a part of the finishing mills at Steubenville, and it is expected to have the entire plant going by Thursday morning or Thursday night. The company estimates its loss at about 6000 tons in output, but the damage to its plant was slight.

The Soho blast furnace, plate mills and smaller finishing mills embraced in the Soho works of the Jones & Laughlin Steel Company, Pittsburgh, were under water. The blast furnace lost two days, the plate mills three days and the four open-hearth furnaces were off four days. The entire Soho plant is again in full operation. Very little damage was done to the Aliquippa works of the company, none of the four blast furnaces being reached by the high water, but the rod mill lost four turns and the blooming mill five turns. The entire Aliquippa plant is again going full.

Condition of Furnaces and Steel Works Operated or Controlled at Cleveland

CLEVELAND, OHIO, April 1, 1913.—Out of the nine blast furnaces that were in operation in Cleveland eight were forced to shut down because of high water, the only stack remaining in operation for several days being the Emma furnace of the American Steel & Wire Company. The steel plant of the Upson Nut Company was also shut down, but of the other Cleveland iron and steel mills, including those of the American Steel & Wire Company, none was affected.

The four Central furnaces of the American Steel & Wire Company were banked March 25 because of the Cuyahoga River flood. Two of these resumed on March 29, one on March 30 and the fourth was started up April 1. All could have started March 29 had coke been available.

The Upson Nut Company blast furnace and steel plant shut down March 25. Both resumed March 31.

Corrigan, McKinney & Co.'s River furnaces banked March 25. The machinery was partly under water and some of the tracks were washed out. The stacks will probably resume by the latter part of the week.

The Cleveland Furnace Company's stack, only one of the two being in operation, banked March 25. It resumed April 1.

Josephine, Pa., and Scottdale, Pa., furnaces of Corrigan, McKinney & Co. and the Buffalo furnaces were not affected by the coke shortage.

The operation of Cherry Valley furnace, Leetonia, Ohio, was not affected by the flood.

Fannie furnace, West Middlesex, Pa., was banked March 25 and has probably not yet resumed.

Dover furnace, Canal Dover, Ohio, was banked March 25 but was in operation March 30.

The Struthers Furnace Company's stack, Struthers, Ohio, was banked March 25. Some of the electrical equipment and other machinery were under water. Expected to resume on Tuesday.

Of the two Andrews & Hitchcock furnaces, Hubbard, Ohio, one has been operated without interruption; the second stack was banked because of scarcity of coke but resumed Tuesday.

Ella furnace, West Middlesex, Pa., banked March 25; resumed late March 31.

The two Toledo furnaces and Perry furnace of Pickands, Mather & Co. and the two Detroit furnaces of M. A. Hanna & Co. were not affected by the flood situation. There was a prospect for a day or two that all these stacks would have to shut down because of scarcity of coke, but it is believed that this danger has been averted.

The Stewart Iron Company's furnace, Sharon, Pa., was blown out March 25. Water went up into the furnace, putting out the fire. This stack will require relining and will not be placed in blast for about six weeks.

Northern Ohio Metal Working Industries

The manufacturing industries in Cleveland and other parts of northern Ohio in various metal working lines fortunately escaped serious damage from the floods last week, but many were compelled to shut down for several days because of high water, inability to secure power from commercial plants, or for other reasons due to the floods. Railroad traffic throughout the State was almost suspended, mail service in many cities completely so, and telephone and telegraph communication was cut off. Business was largely at a standstill for several days. In Cleveland outside of blast furnaces and one steel plant very few manufacturing plants were interfered with, although some that depend on commercial electrical power were forced to suspend for two or three days.

Canton was badly flooded and while the manufacturing plants, escaped with very little damage operations were generally interfered with. The pits of the Stark Rolling Mill Company were flooded, forcing a shut down for four days. None of the other plants were completely closed.

At Massillon, Hess, Snyder & Co. suffered some damage and their plant was shut down several days, resuming operations March 31. The shops of the Massillon Foundry & Machine Company and one of the foundries of the Griscom-Russell Company were badly flooded. The Massillon Iron & Steel Company and the Massillon Rolling Mill Company escaped damage. However, manufacturing industries in that city were practically at a standstill for several days because water, gas and light were shut off.

In Warren the lower sections of the city were flooded, but the manufacturing plants generally escaped damage. However, the electric light plant was shut down and manufacturers who depended upon those plants for power had to suspend operations for several days. In Toledo flood conditions were quite serious in the lower part of the city and some of the smaller manufacturers were forced to shut down, but the larger plants were not interfered with.

In the Ohio Valley and Southwestern Ohio

CINCINNATI, April 1, 1913.—(By Telegraph).—The daily press has given a great deal of attention to the loss of life in the floods in the Central West; but the property loss has been barely touched. Every furnace in the Ironton district is closed down. Several were forced to bank on account of the high water and others shut down for lack of coke. The situation so far as Cincinnati is concerned at the present time is a very serious one; without exception all machine tool plants in the Camp Washington district are closed down as well as those at Winton Place. Others in different parts of the city have been compelled to suspend operations on account of lack of coal.

The loss of life and property at Hamilton in the section near the Niles Tool Works and the Hoozen, Owens & Rentschler Company plants was very serious and it will be at least two weeks before accurate estimates can be made up. The office records of the Long & Allstatter Company were obliterated by the flood. Several other manufacturing firms had the same experience.

Reports from Dayton would indicate that the situation

is in better shape than at Hamilton, although the Platt Iron Works and the Barney & Smith Company are understood to have sustained serious losses. At the latter plant many new cars were seriously damaged.

At Middletown the American Rolling Mill Company succeeded in starting its East Side works with only a shutdown of one day. Probably 90 per cent. of the foundries in this section are closed down on account of the floods. This also applies to the machine tool plants, with the exception of those at Oakley, a Cincinnati suburb. No estimate can now be made up of the financial loss that has been sustained by Lockland, a nearby manufacturing town, but it is known to be heavy.

Flood News from Various Districts

The Chase Foundry & Mfg. Company, Columbus, Ohio, advises us that as its shops are located outside the flooded district of that city its operations were not interrupted by water. From the Columbus railroads the company had assurances that they would be able to handle freight early this week.

Franklin, Pa., industries suffered badly, the plants of the American Steel Foundries, the Franklin Rolling Mill Company and the Chicago Pneumatic Tool Company being under water and closed for five or six days. Oil City, Pa., had the worst flood in its history and the whole town was practically submerged. All the manufacturing plants there suffered severely, but no estimate of the damage done can be made. Titusville, Pa., was also under water, all the manufacturing plants at that place being shut down and some badly damaged.

The plant of the Hydraulic Press Mfg. Company, Mt. Gilead, Ohio, was shut down for 24 hours last week by the flood. The natural gas the company depends on for power was cut off by breaks in the gas mains where they cross the Olentangy River. The main shop was also flooded with water.

Our Louisville, Ky., correspondent writes: "Among the concerns directly interfered with by the Ohio River flood are the Ewald Iron Company, Louisville; and the New Albany Mfg. Company, the Ohio Falls Iron Company, the S. J. Gardner Foundry Company and the C. Hegewald Foundry Company, New Albany. All suffered from the flood in January. The plant of the Dow Wire & Iron Works, Louisville, may also be invaded by the high water. On Monday of this week water surrounded the rolling mill of the Ohio Falls Iron Company, at New Albany, for an area of six blocks."

Respecting conditions in Columbus, the following information has been received from H. H. Kress, advertising manager of the Jeffrey Mfg. Company:

All of the bridges to the west side of Columbus over the Scioto and Olentangy rivers were washed away, with the exception of the Fifth avenue and Rich street bridges. About one-fifth of our city's population living on the west side were still, on March 31, without water supply, gas and electricity. The Jeffrey plant and nearly all of the homes of the employees escaped the floods and while the plant is operating every day with reduced forces on account of some of our men searching for relatives and friends, while others are doing various labors in the relief work, the works are pushing orders and expect express and freight shipment to be resumed by April 1."

Later information from Mr. Kress is to the effect that the majority of the Jeffrey employees have returned to take up their regular duties and all of the departments and shops are working full time, and it is expected that a great many departments will be pressed to overtime, nights and Sundays in emergencies to catch up. Where the bridges are gone, temporary arrangements are being made to facilitate handling of passengers, mail, express and freight. Hundreds of gangs of laborers and workmen of all kinds have gone to work to repair roadways, clearing up debris, replacing wires, etc.

Judicial Decisions of Interest to Manufacturers

ABSTRACTED BY A. L. H. STREET.

COMPENSATION FOR MANUFACTURING MACHINES.—Plaintiff, a machine works concern, agreed to construct a recently patented machine from a model, under a contract making it a joint venture from which, if successful, the returns to all parties would be large, and, if a failure, plaintiff was to receive about 25 per cent. of the actual cost. Plaintiff constructed the machine mainly according to the model and in the manner acquiesced in by the other contracting parties and it proved a failure. Held that the fact that there was a slight deviation from the model, which could have been easily corrected on suggestion made, did not bar plaintiff's right to recover the amount agreed upon in case of failure. (New York Supreme Court, Third Appellate Division, Glens Falls Machine Works vs. Robinson, 138 New York Supplement 386.)

TIME FOR DELIVERY OF FREIGHT.—In computing the reasonable time to which a railroad company is entitled in making delivery of a shipment, when no time was fixed by the contract for transportation, the company is not entitled to any benefit from the fact that the traffic on its road was unusually heavy, if the shipper had no notice of that condition when the contract was made. (Texas Court of Civil Appeals, Texas & Pacific Railway Company vs. Langbehn, 150 Southwestern Reporter 1188.)

SCOPE OF SHERMAN ANTI-TRUST ACT.—The Sherman anti-trust act does not preclude consolidation of three corporations engaged in manufacturing non-competing patented machines used collectively in producing an article, though the effect be to concentrate in the hands of the consolidated company a large part of an industry. (United States Supreme Court, United States vs. Winslow, 33 United States Supreme Court Reporter 253.)

WHEN SELLER MUST TENDER DELIVERY.—If on a contract buyer's statement that he will not accept delivery the seller elects to sue for the price and not for damages for breach of the contract, he must tender delivery to the buyer, notwithstanding such statement by the buyer. (Iowa Supreme Court, Pate vs. Ralston, 139 Northwestern Reporter 906.)

RECOVERY OF PAYMENT MADE UNDER MISTAKE.—An employers' liability insurance company having, through mistake, paid a larger sum under a policy than it was liable for is entitled to recover the excess. (Minnesota Supreme Court, Aetna Life Insurance Company vs. Flour City Ornamental Iron Works, 139 Northwestern Reporter 955.)

VALIDITY OF PROVISION FOR FIXED DAMAGES FOR BREACH OF CONTRACT.—On breach of contract to buy machinery the seller will not be permitted to recover more than the actual damage sustained by him, if it can be readily ascertained, though the contract contains a provision that in case of a breach the buyer will pay 25 per cent. of the price and 10 per cent. additional attorneys' fees. (Arkansas Supreme Court, Dilley vs. Thomas, 153 Southwestern Reporter 110.)

SALES TO INSOLVENT DEALERS.—A seller of a carload of metal to a bankrupt has the right to retain a check and notes received from the latter as payment of the price or as collateral security, regardless of whether he knew that the bankrupt was insolvent when the check and notes were delivered; the metal having become a part of the assets of the buyer's estate in bankruptcy. (United States District Court, District of Connecticut, Burnes vs. Epstein, 201 Federal Reporter 393.)

RIGHT OF SELLER OF MACHINERY TO MECHANIC'S LIEN.—The seller of machinery installed in a building is not entitled to a mechanic's lien. (United States District Court, Eastern District of Tennessee, in re American Lime Company, 201 Federal Reporter 433.)

WHEN BUYER NEED NOT GIVE SHIPPING INSTRUCTIONS.—Under a contract for a sale of goods to be shipped "as soon as packed," without further provision for shipping instructions, the seller cannot excuse failure to make delivery because the buyer did not give shipping directions promptly. (New York Supreme Court, First Appellate Term, Seeman vs. Charles M. Scott Packing Company, 139 New York Supplement 944.)

EMPLOYER'S RESPONSIBILITY FOR POLICE OFFICER'S ACTS.—Where a manufacturer, with the consent of public authorities, employs police officers to represent him and do special work in protecting property and maintaining order, as in the case of a strike, and such officers are engaged in the performance of their duties to the manufacturer, they become his employees in the sense that he is liable for grossly negligent acts, wantonly and unnecessarily committed by them in the line of their work. (United States District Court, Southern District of New York, Kusnir vs. Pressed Steel Car Company, 201 Federal Reporter 146.)

Scientific Selection of Foremen

What Has Resulted from Studying
Relationship Between Man and Boss

From a synopsis of an address delivered by Dr. Katherine M. H. Blackford of the Emerson Company, before the Western Economic Society, Chicago, March 15, have been taken the following observations on the element of harmony in selecting the foreman who can derive the most desirable results from the men and thus secure greater efficiency:

Harmony between man and boss depends upon the proportion and nature of the positive and negative elements of character in each. An extremely positive boss will not work harmoniously with either extremely positive or extremely negative men—and conversely. As to disposition, there are several types of executives, two of which, very commonly met, may be analyzed as follows:

Positive—or Driving	Negative—or Drawing
Keen	Mild
Quick	Deliberate
Domineering	Persuasive
Changeable	Constant
Impatient	Patient
Opinionated	Teachable
Excitable	Calm

The positive, driving type, if given men of his own degree of positiveness, will arouse antagonism and insubordination. The negative type, if given men of his own disposition, will fail to arouse enthusiasm and stimulate action. Give the positive boss men several degrees more negative than himself and the negative boss, men several degrees more positive than himself, and the result is harmony.

Educate the boss, in addition, to apply the principles of efficiency to the job and the principle of character analysis to his men, and the problems of management are solved. This is the ideal.

In practice it is slow work to enter an organization already established and adapt these principles—and plans based upon them—to conditions and traditions. In a large manufacturing plant, employing about 2500 men and women, we have been striving toward this ideal for six months. The results obtained are good, but as yet far short of our ultimate expectation. Certain small economies have, however, been effected in all parts of the plant to inspire us to continued and greater effort.

One example, taken from our experience in connection with the crudest labor in the organization, will suffice. When we began work the yard gang of 123 men was commanded by a brilliant, dashing, intensely likable young foreman who, because of these qualities, was popular throughout the organization and held the confidence of his superiors. Coming under observation of one of our experts, he was reported to be unreliable and undesirable in several respects. Careful investigation of his department revealed many irregularities.

A successor was scientifically selected and assigned for this work, and, through co-operation with the efficiency department and executives of the company, he effected the following economies: During the last three weeks of October the former foreman kept an average force of 123 men, with an average payroll of \$1,823.46. The production consisted of heavy machinery, an average output of 62 units a week. During the last week in January, after the new foreman had been in charge three months, the average number of men was 51.8, and the payroll for the week \$639.25. The production was 122 units; the reduction in cost per unit was therefore \$28.53. The actual payroll during the last week in October, 1912, was \$1,688.30. The actual payroll for the last week in January, 1913, was, as I have said, \$639.25, showing a reduction in the payroll per week of \$1,049.05.

If the present efficiency is maintained for a year, the economy effected, in this one department, will amount to \$54,550.60, and the production, if maintained at the present rate, will be practically doubled. Since such economies can be effected through scientific selection and assignment in the lowest and cheapest grades of employment, what can be and is being done with higher executives and more skilled labor by the same methods is so revolutionary that I dare only challenge your imagination as to facts and figures.

Dry Rot in Construction Timber

Experiment and Observations on the Destruction of Lumber in Buildings

A short paper on dry rot in timber used in slow-burning construction was contributed to a meeting in Boston, November 15, of the Boston section of the American Society of Mechanical Engineers, by Frederick J. Hoxie, Phenix, R. I. From this paper, which is printed in the March journal of the society, the following interesting experiment is reported:

The author arranged an experiment to determine whether the rosin in long-leaved pine heart wood was an important factor in resistance to fungus. A cubic block of dense fine-grained wood 2 in. on a side, containing 18 per cent. rosin, was sawed in two across the grain, and half of it was boiled in benzole until practically all the rosin was removed. The solvent was driven off, and a piece of wood containing living dry rot fungus was placed between the two blocks. The whole was placed in a moist atmosphere and the fungus allowed to grow for a year, at the end of which time a dense white growth had formed over each block. This growth was removed, the blocks dried and weighed. The specimen from which the rosin was removed had lost 8 per cent., the other only 2 per cent. Neither showed the brown color characteristic of rotten wood until after they had been dried for some time.

Destruction of Dry Rot

Mr. Hoxie stated that dry rot fungus, though not as common as several other varieties, has a thermal death point less than 100 deg. F., so that the practical application in the case of these fungi is that they may be destroyed in many cases by use of the building heating system. A badly infected mill can be given a cure or one can get good results if the heating is applied soon enough, but he mentioned that the cure is not likely to affect the growth of fungi in the ends of beams in the brick wall where the heat does not readily penetrate. His suggestion is that when there is any question as to the quality of the stock used in the building heat is worth trying and should be done as soon as possible after the building is completed.

Several of the more common fungi which destroy basement floors, fence posts and railway ties are capable of resisting temperature up to the boiling point of water. It appears also that these fungi have strands sometimes several feet long, capable of traveling for some distance across masonry or metal from beam to beam. Diseases of timber, he suggested, like diseases of men, have excited more interest in cure than in prevention. Prevention is by far the best procedure, he added, and much work has been done along this line on railroad ties, telegraph poles, etc. In conclusion Mr. Hoxie said, in part:

Rot Preventive Measures

Numerous antiseptic compounds have been suggested, creosote compounds and chloride of zinc being probably more commonly used than any others. Creosote, however, is objectionable in buildings owing to its black, greasy nature, its somewhat increased fire hazard and disagreeable smell. The kyanizing process of treating timber with corrosive sublimate solution has been used more or less frequently with good results. Although its cost, corrosive qualities and poisonous nature have probably operated to prevent its more general use, it appears to be well adapted to treatment of factory lumber. Chloride of lime appears to encourage the disease rather than remedy it.

The season for cutting timber seems to have only a secondary importance, but the dryness of the wood, whether the moisture be sap or rain water, is an important factor. Preserving timber under water prevents fungus growth while the material is in storage, as fungus cannot grow without an air supply. It may also have some benefit in dissolving from the outer parts of the wood where infection must start some of the nitrogenous constituents which serve as food for fungi. Further investigation is however needed along the line of the chemistry of seasoning and heart foundation.

Quick-growing timbers will continue to come into more general use owing to their more rapid reproduction. The author's experiments would indicate that hard pine, to be

able reasonably to resist fungus in building construction without antiseptic treatment, should contain about 10 per cent. of rosin. Artificial saturation of wood with rosin has been tried without very satisfactory results, owing to the lack of penetration. It should not absorb over 5 lb. of water per cubic foot in 24 hours at 70 deg. F. from kiln dry conditions, and should weigh not less than 38 lb. per cubic foot kiln dry. These characteristics generally accompany fine-grained material, and with them fine-grained material is better than coarse grained, while without them the fine grain does not appear to be a saving quality.

Duff Mfg. Company's Expansion

The Duff Mfg. Company, manufacturer of Barrett lifting jacks, etc., has moved into its new plant and general office building located on Preble avenue, North Side, Pittsburgh, its old works on Marion avenue having been dismantled. The new factory building, comprising approximately 68,000 sq. ft. of area, is of the most modern type, and is located on a tract of about five acres, with Pennsylvania and Baltimore & Ohio sidings, and near the plants of the American Locomotive Company, Pressed Steel Car Company, Standard Sanitary Mfg. Company, and Riter-Conley Mfg. Company. The Duff Company plans the erection of a plant in the Chicago district and expects to have it in operation by next fall, the question of location now being under definite consideration. A Canadian factory will also be equipped the coming summer, to be in operation by the early fall; it will be located at Windsor or Hamilton, Ontario. The product of the company comprises jacks for practically every purpose.

Edmund Gram and Max W. Richsteig, president and general manager respectively of the Gram-Richsteig Piano Company, Milwaukee, have organized an \$180,000 corporation under the laws of Illinois, to manufacture steel angle frame actions for the piano manufacturing trade. The company will have headquarters in Chicago and proposes to erect a building, 69 x 200 ft., of fireproof construction, at Eighty-first street and Wentworth avenue, Chicago. The company will require a fair-sized list of tools of all kinds and is preparing to purchase. Max W. Richsteig will be general manager of the works and will remove to Chicago at once. T. F. McFarland and M. P. Bransfield of Chicago are associated in the enterprise.

A meeting of stockholders of the Youngstown Sheet & Tube Company will be held in Youngstown, Ohio, May 1, to vote on a proposition to increase the common stock of the company from \$10,000,000 to \$20,000,000. It is expected that a stock dividend of 40 to 50 per cent. will be declared and the remainder will be held in the treasury for the purpose of making future improvements and extensions on which no definite plans have yet been made. The company will then have a total capital of \$25,000,000, divided into \$5,000,000 preferred and \$20,000,000 common.

Laborers at the plants of the Alan Wood Iron & Steel Company, at Ivy Rock and Conshohocken, Pa., went on strike last week after demanding an advance from \$1.55 to \$2 a day. At the Ivy Rock plant the matter was adjusted without interfering with the operation of the works, a rate of \$1.75 a day being agreed upon. The sheet mills at Conshohocken are temporarily idle, pending negotiations with the men.

The Baltimore & Ohio Railroad has ordered 1500 freight cars from the American Car & Foundry Company, the Pressed Steel Car Company and the Standard Steel Car Company, each receiving one-third of the contract. The Louisville & Nashville Railroad has purchased 700 steel underframe cars from the Mt. Vernon Car Mfg. Company, 600 from the Pressed Steel Car Company and 100 from the Bettendorf Company.

The new hydroelectric plant constructed at Mammoth Spring, Ark., has been completed and the current turned on. It will serve towns in southern Missouri and northern Arkansas. The company is incorporated as the Mammoth Spring Electric Light & Power Company and Frank F. Hill, Memphis, Tenn., is the chief owner.

New Tools and Appliances

This is essentially a news department for which information is invited

Compensating Dog for Milling Machine.—A compensating milling machine dog developed particularly for indexing work which has to be held on a short arbor and where the table has to be swung over at an acute angle has been produced by the Ready Tool Company, Bridgeport, Conn. The dog has a universal ball and socket joint to overcome lost motion, and is designed to eliminate torque as well as to avoid striking the overhanging arm of the milling machine.

Portable Air Compressor.—For general shop use, the Brunner Mfg. Co., Utica, N. Y., is placing on the market a portable air compressor which is operated from any electric light socket. It is of the two-cylinder design, is 41 in. long, 27 in. wide and 46 in. high, the weight being 500 lb. Sufficient capacity is possessed by the machine to store air for a period of continuous operation, ranging from 10 to 20 min., the time varying with the diameter of the nozzle and the pressure. The delivery of a steady pressure of from 10 to 60 lb. while the pressure of the tank is 150 lb. is made possible by the use of a regulating valve.

Internal Grinding Machine.—The Rivett Lathe & Grinder Company, Brighton, Mass., has recently added a wet grinding attachment to its regular internal grinding machine which is especially adapted for toolroom use. The water tank and pump are located on the back of the machine, the latter being driven from an overhead countershaft through pulleys located on the top of the tank. The table which has a swing of from $\frac{1}{4}$ to 6 in. is built in two sections, the upper or slide, and the lower or table proper. A reciprocating mechanism, so designed that as the center of the stroke is approached the speed of the table is slightly retarded and correspondingly accelerated as soon as the central point is passed, controls the power movement of the table. It is possible to swivel the upper portion of the table to a maximum of 5 deg. on each side of the center and a pilot wheel controls the hand movement of the table. Cross feed is provided through the cross slide which can be set at any angle up to 90 deg. by graduations on its base. The swing over the table is 7 in. and the grinding capacity is the same as the travel, from $\frac{1}{4}$ to 6 in. Three work-spindle speeds are available and the table speeds range from $7\frac{1}{2}$ in. to 30 ft. per min. Although essentially an internal grinding machine, it can also be used for external grinding by applying attachments which are regularly supplied for this purpose.

Set-Over Lathe Turret.—For outside turning, facing, boring and recessing with a single-point tool, the Acme Machine Tool Company, Cincinnati, Ohio, is making a set-over lathe turret in which the movement is operated by a ball handle and screw having a micrometer dial. The backward movement of the turret slide revolves the turret automatically and the locking bolt is placed at the front end of the slide and works in the hardened and ground taper bushings let into the solid turret near the edge. Means for taking up side wear are provided by taper gibs running the entire length of the saddle which rests on an adjustable taper base. There is a center stop for bringing the turret holes in line with the spindle and to prevent longitudinal movement while the turret is being moved in a crosswise direction a binder handle is furnished for clamping the slide.

Swing Frame Grinding Machine.—W. D. Pratt, Canton, Ohio, has developed a design of swing frame grinding and polishing machine, in which the machine is suspended and the wheel can be readily brought to the work. The entire machine swings on the countershaft and a counterweight is furnished for the frame carrying the wheel. For the sake of safety, the wheel is located at the side of the operator. If desired the machine when fitted with a circular wire brush can be employed for cleaning castings and performing similar operations on account of its flexibility.

Combination Nut Wrench.—A combination wrench which is intended for use where it is undesirable to carry many wrenches has been designed by Norton W. Johnston, Astoria, N. Y. Steel stampings and forgings are employed for most of the parts of the wrench, two

screws serving to hold the tool together. Eight different sizes of nuts can be tightened or loosened by the wrench, but this number, of course, can be changed, or the range of sizes varied to suit conditions. The nut plate is operated by a ratchet wheel and is held by a pawl which is fitted behind with a torsion spring that tends to keep the pawl always in contact with the ratchet wheel. The advantage claimed for this arrangement is that the nut plate can be adjusted to any desired position to engage nuts which are not conveniently located.

Steel Scale.—A new style of machinist's steel scale is being manufactured by the Lufkin Rule Company, Saginaw, Mich. This rule has been developed to facilitate accurate measurement and rapid reading in laying out close work, and one side is graduated in thirty-seconds and sixteenths to take care of all the even sixty-fourths, while the other side of the rule takes care of the odd fractions. This is done by having the graduations corresponding to 1-64, 3-64, 5-64, 7-64, etc., on one edge of this side, while those corresponding to 3-64, 7-64, 11-64, etc., are on the other edge. In this way, all the odd sixty-fourths are given, and yet there are only 16 lines to inch. The denominators of the fractions are omitted in all cases, which enables the figures to be made large enough to be easily read.

Improved Type of Engine Lathes.—A number of improvements have been recently made by the Reed Hardware & Mfg. Company, Cairo, Ill., to the line of lathes which it builds. Among these may be mentioned the use of heavier construction throughout, the addition of a set-over screw and feed pinion for the tailstock. The design of the tool block and the compound rest have been changed and all the pinions and gears in the apron are now made of steel. The feed screw split nut has been lengthened and the friction lock has also been improved. A lever on the apron enables both the lateral and the cross feeds to be easily reversed and the lead screw is splined so as to act as the feed rod. The swing of these tools ranges from 20 to 30 in. and the beds are regularly made in lengths ranging from 8 to 10½ ft. The weight varies, according to the size, from 2500 to 6000 lb.

A New Electric Motor With Special Torque.—For driving bending rolls, raising the cross rails of planing machines and boring mills, moving the tailstocks of large lathes and performing similar service where a motor with special torque characteristics is required, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has placed on the market a new unit. These motors are designed for use on 230-volt direct-current circuits, and are made in sizes ranging from 3 to 40 hp. The special feature of the motors is a heavily compounded field, most of the excitation being produced by the series coils. This arrangement results in the securing of a torque which increases rapidly with the current input, a feature that is necessary in starting a cross rail or taking a plate through a set of bending rolls, while the shunt field winding limits the no-load speed to approximately twice that at full load and thus prevent racing. Strong mechanical construction characterizes the motors, the frame being made of rolled steel and the armature shaft of axle steel. The proportions of the bearings, which are both dust and oil proof, are ample. Commutating poles are employed with the result that practically sparkless commutation is secured. But little attention is said to be required by these motors, as the lubrication is automatic and the brushes require renewing at infrequent intervals.

Embossing and Forming Mill.—The W. W. Oliver Mfg. Company, 1500 Niagara street, Buffalo, N. Y., has recently added a second roll frame to its regular No. 4-A triple-gear, power rolling mill, the rolls carried by the second frame being driven from those in the main frame by a chain. This machine is intended for use where the stock is to be formed to such an extent that two pairs of rolls are necessary and a considerable saving of time is said to have been effected in operations of this character. One class of work handled by this machine consists of sheet tin strips 0.010 in. thick which are embossed and crimped, the embossing operation being performed by the regular rolls, while the crimp is put in the work by the auxiliary pair. The stock is fed straight through from one pair of rolls to the other, thus eliminating any waste of time.

The Machinery Markets

Some prospective railroad business of good proportions in Chicago and the East and a halt in the Central West because of the floods are the principal features of the markets. In nearly every city small sales have predominated, although here and there they have reached good totals. Business improved in the latter part of March in New York, but February's total was not equaled. The Boston & Maine Railroad is placing orders against its large list of several months' standing. The Philadelphia trade has before it a large number of inquiries from the Pennsylvania Railroad and has had a fair scattered trade. The Cleveland market is practically at a standstill because of the floods; plants are shut down and little activity is expected for a couple of weeks so far as output is concerned. While the sales in Detroit were mostly for single machines they were in good volume and March proved satisfactory. The month showed an improvement over February in Milwaukee and good conditions there are expected to keep up. In Chicago, where business has been only moderately satisfactory, the Wabash list will be closed soon and is expected to have a wide distribution, but the trade hears that the Lake Shore & Michigan Southern Railway will abandon its project for a \$2,000,000 shop and confine its purchases to equipment which is urgently needed. The Central South has been hampered by flood conditions, especially around Louisville, although further South conditions are normal. Activity in St. Louis continues chiefly in single tool propositions with the market quiet. Anticipation of a large cotton crop in Texas is stimulating demand for new gins and seed-handling machinery. On the Pacific coast the volume of small orders shows improvement and demand is growing for logging and sawmill equipment.

New York

NEW YORK, April 2, 1913.

The most interesting developments of recent date are requests for estimates on a large amount of shop equipment required by the Pennsylvania Railroad and the taking of final steps in closing the big list issued by the Boston & Maine Railroad some months ago. Practically every manufacturer's direct sales office in New York has been asked to bid on one or more machines of his line by the purchasing department of the Pennsylvania and it is expected that deals will be closed without great delay. Further encouragement has come to the trade in the revival of a list which was put out tentatively by the mechanical department of the Western Maryland Railway last November. About \$25,000 worth of machine tools and round-house equipment are required, principally at Hagerstown and Cumberland, Md. The list is now in the hands of the purchasing department of the road. The Harlan & Hollingsworth Corporation, Wilmington, Del., is in the market for a few machines, including a 30 or 36-in. heavy type planer, rotary splitting shears, power plate punch, two multiple punches, heavy capacity 26-in. shaper and square shear press. The Mead-Morrison Mfg. Company, Boston, Mass., closed against the list it announced a few weeks ago. Inquiries of a miscellaneous character have maintained an excellent volume, but despite the number of these, the trade generally sums up the month of March as only fair and not nearly as good as was February. There was a betterment toward the end of the month, otherwise its showing would have been very poor with some companies. The prospects for April, as already indicated, are improved.

The Merchants Refrigerating Company, 161 Chambers street, New York, is taking estimates through J. B. Snooks' Sons, architects, New York, for the erection of an addition to its refrigerating warehouse at 47 River street, Newark, N. J. The building will be 50 x 100 ft. and is estimated to cost \$150,000. Equipment details are not as yet completed.

Vardon & Co., Inc., West New Brighton, N. Y., has been incorporated with \$100,000 capital stock to build boats, vessels, etc. The company has taken over the plant formerly operated by Waters & Culver at West New Brighton. The incorporators are Charles A. Girvin, T. F. Kelly, New York, and Alexander Hillyard, 398 Decatur street, Brooklyn, N. Y.

The Divine Tire Demonstrating Company, Utica, N. Y., recently mentioned as having incorporated with \$225,000 capital stock, states that it will not erect a factory but is negotiating for one already constructed. The equipment will consist of gap lathes, hydraulic presses, etc., used in the manufacture of automobile truck tires.

The Augustine Automatic Rotary Engine Company, Buffalo, N. Y., is having plans prepared for an addition, 63 x 88 ft., to its boiler house and stockroom.

The Pelletier Tin Can Company, Inc., Maspeth, N. Y., has been incorporated with a capital stock of \$25,000 to manufacture tin cans, boxes and sheet metal work of various kinds. N. and H. Pelletier and E. M. Colmey, Second street, Maspeth, are the incorporators. Arrangements for a factory are under way.

The United Safety Appliance Company, Fabius, N. Y., has filed articles of incorporation with \$200,000 capital stock for the purpose of manufacturing and dealing in fire escapes, etc. Henry J., Edward C. and Charles H. Howe are the incorporators.

The Boeck Mfg. Corporation, Farmingdale, N. Y., has been incorporated with a capital stock of \$100,000 to manufacture shades, curtains, etc., and a factory will be established. A. A. Boeck, E. C. Hill, New York City, and C. H. Norton, Brightwater, N. Y., are the directors.

The Union Sanitary Mfg. Company, Syracuse, recently incorporated, has leased a factory at 1812-14 Park street, and will equip it with requisite machinery for the manufacture of plumbers brass goods, sanitary fixtures and woodwork. The president of the company, L. Unckless, was formerly superintendent of the Century Sanitary Mfg. Company's plant at Eastwood.

Winslow's Hydrolithic System, Inc., Tonawanda, N. Y., has been incorporated with a capital stock of \$75,000 and will engage in the manufacture of waterproof cement. A plant will soon be established and equipped. The directors are Edward J. Winslow, North Tonawanda; Emery C., Herman F. and William H. Pronger, Blue Island, Ill., and Louis J. Frey, New York City.

The Hutchins-Kilburn Company, North Tonawanda, N. Y., is building a one-story addition to its plant on Schenck street.

The Niagara Paper Bag Company, North Tonawanda, N. Y., is enlarging the manufacturing facilities of its plant on Schenck street and is installing much new machinery.

The Buffalo Sled Company, North Tonawanda, N. Y., will soon start construction on a three-story addition, 40 x 60 ft., to be made to its factory on Marion street.

The Cary-Davis Company, Inc., Buffalo, has been incorporated with a capital stock of \$60,000 and will manufacture and deal in dishwashers and other household articles and appliances and will establish a plant for the purpose. The incorporators are P. B. Cary, M. A. Johnson and P. M. White, 1200 D. S. Morgan Building.

The International Brewing Company, Buffalo, will erect and equip a boiler house at its brewing plant Niagara and Albany streets.

The Cataract Power & Conduit Company, Electric Building, Buffalo, has let contract to Whitney & Denderger for the erection of an addition to its transformer station at East Ferry and Kehr streets.

The Buffalo Package Company, Buffalo, recently incorporated, has purchased the factory property of the Buffalo Pail & Barrel Company, Babcock street and the Erie Railroad and is equipping it with new machinery for the manufacture of pails, barrels, etc.

The W. Robertson Machine & Foundry Company, Buffalo, N. Y., is planning to build an extension to its factory of about 6000 sq. ft. to increase its output.

The Reliable Stamping Company, Buffalo, has filed incorporation papers with an authorized capital stock of \$20,000 to manufacture stamped and pressed metal goods and will equip a factory for the purpose.

Cleveland Pond, Ellicott Square Building, and James H. and Edward P. McCaffrey, 412 West Ferry street, are the incorporators.

The Puritan Woolen Mills Corporation, Erie, Pa., has filed incorporation papers and will build and equip

a plant for the manufacture of woolen, cotton and silk goods. F. H. Paul, E. F. Smith and A. H. Gull are the incorporators.

The Pennsylvania General Electric Company, Erie, Pa., is completing plans for a number of additions and new buildings to be erected at its plant adjoining that city, including a 150 x 250 ft. extension of the cleaning rooms building for the gray iron foundry, and a 275 x 400 ft. extension of the machine shop, equivalent to four stories. Electric crane equipment will be installed.

The Erie Malleable Iron Works, Erie, Pa., has plans under way for an extensive addition to be made to its plant this spring. Tentative plans are for a building approximately 300 x 600 ft., four stories.

The Rome Wire Works, Rome, N. Y., has had plans prepared for the erection of an addition 135 x 200 ft., one story, to its plant in Railroad street. The estimated cost is \$30,000.

Catalogues Wanted

Catalogues and discount sheets are wanted as quickly as possible by the M. D. Larkin Supply Company, dealer in factory supplies, Dayton, Ohio, the company requesting this announcement by telegraph from Springfield, Ohio, stating that this trade information was all lost in the flood.

New England

Boston, Mass., April 1, 1913.

The dealers report little change in the very good business which has characterized recent weeks. Slight evidences of a tendency to hold back projected orders are noticed, a few customers feeling that they might as well wait a little to see how the tariff situation shapes itself, but as a rule buyers are going ahead with their purchases in utmost confidence as to the future. The brass mills of the Naugatuck Valley are exceedingly busy, and are preparing large increases in capacity. The American Brass Company, Chase and Scovill interests in Waterbury, are building large additions, and smaller concerns are expanding in much the same proportion. The factories which cut up brass into all sorts of articles are very busy. It is noticeable that many works engaged in the brass industry are running overtime, while practically all of them are operating Saturday afternoons. The only serious labor trouble announced in the metal trades is that of molders in the works of the Draper Company, Hopedale, Mass., builder of textile machinery. New England has suffered to some extent industrially because of floods, plants located on some of the rivers being compelled to shut down because of high water.

The latest reports received by the machinery trade from Washington indicate that machine tools are not seriously threatened in the tariff revision.

F. O. Wells and associates of Greenfield, Mass., have purchased the business and plant of Nutter, Barnes & Co., Boston, and will move the shops to Hinsdale, N. H., where they will be incorporated in the works of the Granite State Mowing Machine Company, of which Mr. Wells is the president. W. F. Howe, treasurer of the Granite State Company, has been elected to the same office in Nutter, Barnes & Co. J. W. Nutter and H. A. Barnes retire from the business which they have conducted for a long time, on Atlantic avenue and later on A street, South Boston. The company manufactures cold sawing and saw sharpening machinery. The removal to Hinsdale will be made shortly after May 1.

The Rivett Lathe & Grinder Company, Brighton, Boston, Mass., manufacturer of lathes, grinding machines and milling machines, has changed its selling policy by establishing exclusive selling agreements for Europe and America. When the present management took hold of the business certain European agencies existed; now the greater part of the territory is covered. Buck & Hickman, Ltd., has the United Kingdom; Fenwick Freres & Co., France, Italy, Switzerland and Spain; and F. G. Kretschmer, Germany, Austria-Hungary, Holland, Luxemburg and the Balkan States. The domestic agents are the Prentiss Tool & Supply Company, New York City, Boston, Buffalo, Rochester, Syracuse and Scranton, Pa.; Motch & Merryweather Machinery Company, Cleveland, Cincinnati, Detroit and Pittsburgh; W. E. Shipley Machinery Company, Philadelphia; Hill, Clarke & Co., Chicago; Pacific Tool & Supply Company, San Francisco.

The New Departure Mfg. Company, Bristol, Conn., has let the contract for an office and factory building, 62 x 208 ft., five stories and basement.

The Clark Bros. Company, Milldale, Conn., will erect an addition to its main factory.

The Fryeburg Railway Company, Fryeburg, Me., proposes to build an electrically operated line from that place to Center Lovell, Me., with a branch to Lovell, and ultimately a line to Chatham and Stow.

The Connecticut Power Company, owning the Berkshire Power Company, Canaan, Conn., the Norfolk Electric Light Company, Norfolk, Conn., and the Sharon Electric Light Company, Sharon, has been consolidated by the Stone & Webster interests with the New London Gas & Electric Company, and the Eastern Connecticut Electric Light Company, under the name of the Connecticut Power Company. It is proposed to create a hydroelectric plant on the Housatonic River at Falls Village, with an ultimate capacity of 16,000 hp., of which 12,000 hp. will be developed this year. The power will be carried to the important manufacturing centers of Torrington, Thomaston and Bristol, Conn.

The Weed Chain Tire Grip Company will remove its business from Oneida, N. Y., to Bridgeport, Conn., where a new factory will be erected at Hewett and Logan streets.

The George F. Bradstreet Investment Company, 67 Milk street, Boston, plans to erect a great industrial building at Haverhill, Mass., to consist of three 8-story structures connected at the front. The project entails an expenditure of \$500,000.

Philadelphia

PHILADELPHIA, PA., April 1, 1913.

The feature of the week has been the appearance of the long-deferred general tool list of the Pennsylvania Railroad. The company has not been an active buyer for several years, confining its purchases to odd tools. Merchants and manufacturers have been receiving partial lists in the week and in instances inquiries cover 50 or more tools, but this is not believed to cover the full list, as inquiries to different concerns show some variation. Just how soon actual purchases will be made is not known. Outside of the railroad inquiry there has been considerable scattered demand. The Harlan & Hollingsworth Corporation sent out a small list of punching and shearing machinery, and several other concerns have asked for small groups of tools. Single tool inquiries show some improvement. Sales have been moderate, but the trade is greatly encouraged with the outlook for more aggressive buying. Second-hand machinery has been fairly active. Very little business is moving in the export trade. Foundries continue active, although the demand for machinery castings has been only fair. A good volume of business is pending in power equipment, and while the bulk of the inquiry is for small units some fair size equipment is being figured on.

Frederic H. Hill and Joseph C. Laird, receivers of the Wilkinson Foundry & Machine Company, Norristown, Pa., have petitioned court for permission to dispose of the plant and equipment at private sale to Benjamin F. Evans, Norristown, Pa. The plant has been operated unprofitably by the receivers in the past eight months.

The Pennsylvania Shafting Company, Spring City, Pa., regarding whose plant extensions mention was made in *The Iron Age*, March 20, advises that it has not yet prepared specifications for the machinery and equipment required.

J. G. Xander has disposed of his interest in the Xander Machine Company, 926, 928 and 930 Bingaman street, Reading, Pa., to the Wilhelm-Smith Machine Company, which will continue the business under the direction of W. I. Wilhelm. The plant is equipped for general light and medium class machine work. In the near future an automatic grinding machine will be installed in order to care for machining automobile parts.

Plans are again being revived for the construction of a tunnel under the Delaware River, to connect Philadelphia and Camden, N. J. Private concerns sought to obtain a franchise in Camden several years ago, but the plan was checked by opposition in that city. It is now reported that this objection has been removed and prospects favor the building of the tunnel.

The tool works of Fayette R. Plumb, Inc., Bridesburg, Philadelphia, was damaged by fire March 26. The damage was small and in no way affected the operation of the plant or its equipment.

Announcement has been made of the amalgamation of the Frederick Railroad Company, Frederick Gas & Electric Company, Myersville & Catoctin Railway Company, Hagerstown Railway Company, Hagerstown & Boonsboro Railroad Company, Hagerstown and Northern and the Frederick and Hagerstown Power

Company, under the name of the Hagerstown and Frederick Railroad Company, Hagerstown, Md. These various concerns represent a capitalization of \$10,000,000, and are operating in Frederick and Washington counties, Maryland. Considerable additional rolling stock and equipment to the various electric roads, as well as extensions, are contemplated.

The City Iron Works, Camden, N. J., has been incorporated under New Jersey laws, with a capital stock of \$10,000, with the object of manufacturing iron work and machinery. Particulars are not available. The incorporators are named as Albert Goldner, W. S. Darnell and H. S. Darnell.

The brass foundry of the Schutte & Koerting Company, Twelfth and Thompson streets, was damaged by fire March 27. The loss was small and in no way interfered with the operation of the plant.

The plant of the Knox Mfg. Company, 624 Filbert street, manufacturer of couplings and throttle valves, was badly damaged by fire March 24. Considerable loss on machinery was entailed, which will necessitate the purchase of additional machine tool equipment.

Ballinger & Perrot, engineers, have plans in preparation for three 2-story factory buildings for W. P. Wescott, candy manufacturer, to be erected on Haddon avenue, Camden, N. J. The buildings are to be 60 x 131 ft. each. The same engineers have finished plans for a three-story loft building, to be erected at 1106 Arch street, this city, for John J. McLoughlin. The building will be equipped with electric freight elevators.

The reported fire damage to the carriage and automobile factory of Alexander Wolfington & Son, 810 to 814 North Twentieth street, March 25, was of minor importance, the damage being confined to several automobile and carriage bodies. The operation of the plant was not interrupted.

Bids are now going in for the construction of a one-story brick and corrugated iron machine shop and crane runway, 56 x 70 ft., with a wing 25 x 46 ft., for the Harrison Safety Boiler Works, Seventeenth street and Allegheny avenue. The original building was damaged by fire some time ago.

The Easton Tool & Machine Company, Easton, Pa., has completed the erection of a building for foundry and forge purposes and is installing brass foundry equipment consisting of four furnaces.

Chicago

CHICAGO, ILL., April 1, 1913.

The outlook in the machinery trade, particularly in the direction of railroad sales, is not as promising as might be desired. It is reported that the Lake Shore & Michigan Southern has postponed indefinitely the greater portion of its \$2,000,000 shop building project at Elkhart, Ind., and will limit its purchases to necessary replacements which in value will hardly exceed \$25,000. A long delay is also expected in the buying of any equipment by the Pere Marquette, which has been figuring on new machinery, owing to the difficulty this road is experiencing in satisfying the State Board of Michigan as to its refinancing. The closing of the large Wabash list is the immediate center of interest, a wide distribution of the large number of items being anticipated. For industrial use the general sale of machinery has been moderately satisfying. Sales are most frequently effected where it is possible to ship promptly from stock, the orders being largely for one and two machines. Except for machines of individual specifications requiring direct handling by the builders, current business is largely within the scope of dealers' activity.

The Universal Weather Strip Company, Chicago, has been incorporated with a capital stock of \$2,500 by John D. Pierce, George Heidman, 122 Michigan avenue, and Norman A. Street.

The H. B. Smith Machine Company, Chicago, manufacturer of woodworking machinery, is removing from 558 Washington boulevard to Machinery Hall, Washington and Clinton streets.

The Price Iron & Steel Company, 122 South Michigan avenue, Chicago, has been incorporated with a capital stock of \$10,000 by Arthur M. Price, Jacob J. Price and Samuel Spitzer.

The Pullman Company, Pullman, Ill., suffered a loss estimated at \$40,000 as the result of a fire in one of its manufacturing departments March 22.

The Automatic Devices Company, Galesburg, Ill., has been organized with a capital stock of \$100,000 to manufacture and deal in engine starters, tools and machinery by Charles F. Hurburgh, Edward M. Wharff and Ralph C. Wharff.

The Jacksonville Farm Supply Company, Jackson-

ville, Ill., with a capital stock of \$15,000, will manufacture and sell farming machinery. The organizers of the company are Charles T. Mackiness, Carlin C. Berryman and John R. Mawson.

The Naperville Lounge Company, Naperville, Ill., whose plant was destroyed in the storm of March 23, is to be rebuilt at once.

The Grand Rapids Forging & Iron Company, Grand Rapids, Mich., has been organized with a capital stock of \$30,000 by Christian F. Frey, Mathias Ruoff and Charles A. Hauser. The company is having a shop built to do general forging work.

The Galesburg Writing Machine Company, Galesburg, Ill., recently mentioned as having incorporated with \$100,000 capital stock, states that it will not build a new plant as it has acquired the business of the Chicago Writing Machine Company at that place. It is not in the market for machinery equipment but will make new contracts in the near future for a considerable quantity of cold rolled strip steel, also round, in size under 1 in.

The Belle Plain Gas Company, Belle Plain, Iowa, plans to install a duplicate set of machinery at its plant, the new equipment to involve an expenditure of several thousand dollars.

Gordon & Ferguson, St. Paul, Minn., have taken out a permit providing for the erection of a nine-story brick and concrete factory to cost \$250,000.

William Folks, Fergus Falls, Minn., is starting a new foundry and machine shop in that city.

The American Pressed Brick Company's plant near Michigan City, Ind., was destroyed by fire with a loss of \$50,000.

Cleveland

CLEVELAND, OHIO, April 1, 1913.

The local machinery market was practically at a standstill the past week as a result of the unprecedented floods that caused an immense amount of damage throughout Ohio. The high water washed out many bridges and railroad traffic on all but two or three lines was practically suspended for several days, during which time the mail service between Ohio cities was demoralized. As there was practically no steam passenger or interurban trolley service, salesmen and buyers either stayed at home or limited their efforts to reach home from where they were stranded. A large number of manufacturing plants all over the state were compelled to shut down for several days. While the transportation situation has improved materially, the floods and accompanying damage have so seriously paralyzed business that little activity is expected in the machinery market for the next week or two. Sales in the week were limited to a few small tool orders.

The Chandler Motor Car Company, Cleveland, recently organized with a capital stock of \$425,000, has purchased a 6-acre building site adjoining the Belt Line Railroad north of St. Clair avenue. It is stated that the company will at once commence the erection of a factory. The main building will be a reinforced concrete structure 120 x 420 ft. It is the intention to have the plant ready for operation July 1. The officers of the company include F. C. Chandler, president; C. A. Emlse, vice-president; Samuel Regar, treasurer, and W. S. Mead, second vice-president.

The Cleveland Automatic Machine Company, Cleveland, will enlarge its plant by the erection of a three-story building 60 x 200 ft., of heavy factory type of construction.

The Acme Foundry Company, Cleveland, will enlarge its plant by the erection of an addition, 30 x 100 ft., to be used for pattern storage and core department. The section devoted to pattern storage will be two stories. The company is in the market for about four core ovens.

The Blackburn Specialty Company, Cleveland, will shortly begin the erection of a four-story manufacturing plant at Perkins avenue and East Thirty-fifth street. The building will be 70 x 100 ft. of concrete and brick construction with metal window sash. No new machinery will be required. The company makes automobile and electrical specialties.

The Cleveland City Forge & Iron Company, Cleveland, will erect a new boiler house and has placed contracts for two 400-hp. Babcock & Wilcox Company Sterling type boilers and with the Green Engineering Company for stokers. This addition is the first step toward a number of improvements that are being planned for the plant.

The Van Wert Beet Harvester Company, Van Wert, Ohio, has been incorporated with a capital stock of

\$30,000 to manufacture beet harvesters and other implements. W. H. Dailey, B. B. Leeson, H. E. Allen and others are incorporators.

The Falcon Bronze Company, Youngstown, Ohio, is erecting a brick and steel factory addition, 40 x 100 ft., which will be used to enlarge its foundry capacity. The company will add a new brass melting furnace.

The Peerless Automobile Company has awarded the contract for a one-story building, 27 x 52 ft., which will be added to its present group of factory buildings.

The city of Cleveland will receive bids April 10 for a steam engine and generator for the Collinwood station of the municipal electric light plant.

The Cleveland Tent Company, 1011 Superior avenue, N. W., will shortly begin the erection of a three-story brick and stone factory building at 2633 East Fifty-fifth street near Woodland avenue. The plant will cover a site 25 x 150 ft.

The Mechanical Mold & Machinery Company, Akron, Ohio, has been incorporated with a capital stock of \$10,000 by Frederick Pfeifle, Arthur Nittinger, George Koch and others. The company will make automobile tire molds, dies, etc.

The Imperial Brass Foundry & Mfg. Company, Painesville, Ohio, recently incorporated with a capital stock of \$50,000, has purchased the Foyer plant near the Lake Shore Railroad in that city. It is stated that the company will manufacture brass castings, plumbing, automobile and small railroad castings.

The Hydraulic Press Mfg. Company, Mt. Gilead, Ohio, has plans for extensions which include the building of a new erecting shop, 80 x 100 ft. It will be equipped with a 25-ton electric traveling crane for erecting and loading. Orders for lathes, planers and boring mills have been placed, but the company expects to add a large electric driven horizontal boring mill with 6-in. spindle and a motor-driven planing machine with table 20 ft. x 66 in. between housing. The company manufactures hydraulic presses and pumps.

The Fremont Furnace Company, Ohio, is increasing its capital stock from \$50,000 to \$150,000 and will considerably increase its capacity.

Detroit

DETROIT, MICH., April 1, 1913.

March was a very satisfactory month with the local machine tool merchants, who report a good aggregate of business. Current sales the past week have been of good volume, but are confined strictly to single or very small lots of tools. There is a very good business in small tools and shop supplies, caused mainly by the employment of additional hands by the automobile trade. Second-hand machinery is moving slowly. The general industrial conditions locally are excellent, makers of gas engines are particularly busy. Both iron and steel castings plants continue active. Unseasonable weather is retarding building operations.

At the annual meeting of the Motor Foundry Company, Detroit, it was decided to increase the capital stock from \$35,000 to \$100,000 to provide for extensions to the company's plant and work will be commenced on the new buildings at once. The capacity of the plant which produces gray iron motor castings exclusively will be doubled. Officers elected were: J. H. James, president; E. A. Nelson, vice-president, and L. H. Green, secretary.

The Chapper Wire & Iron Works, Detroit, has acquired a site on Fort street, near Antoine street, and is having plans prepared for the erection of a new factory.

The E. B. Eby Handle Company, Detroit, whose incorporation was recently noted, has acquired a factory site at Twelfth and Antoinette streets and will erect a building 60 x 160 ft. Some woodworking equipment will probably be required.

The Michigan Magneto Company, Detroit, has been incorporated with a capital stock of \$300,000 by David D. McDonald, Daniel E. Stafford and Henry G. Cox to manufacture ignition devices, marine and stationary engine equipment.

The Auto Cycle Parts Company, Detroit, has been incorporated with \$5000 capital stock to manufacture motor cycle parts. The incorporators are Charles A. Redmond, H. M. Lampson and J. J. Pisarro.

The Murphy Wall Bed Company, Detroit, has been incorporated with \$15,000 capital stock to manufacture beds. C. H. Avery is the principal stockholder.

The Cadillac Motor Car Company, Detroit, has awarded the contract for a one-story brick addition to one of its manufacturing buildings.

The Auto Crankshaft Company, Detroit, is having

plans prepared for an addition to its plant and will extend the range of its products.

The T. C. Beach Auto Turntable Company, St. Johns, Mich., has been incorporated with \$10,000 capital stock to manufacture motor car turntables. The incorporators include T. C. Beach, R. S. Clark and W. J. Moss. The company has acquired a factory which will be suitably equipped.

The taxpayers of Ithaca, Mich., have granted a gas franchise to the Wagner Bros. Company, Grand Rapids, and the neighboring cities of St. Louis and Alma will vote on similar franchises April 7. It is the intention of the company to build a central gas plant to supply the three municipalities.

The village of Fennville, Mich., has voted in favor of bonding for \$11,000 for the purpose of building a waterworks system.

The village of Bloomingdale, Mich., has granted a franchise to J. Hawk for electric lighting. Work on the plant will be begun shortly.

The Grand Rapids Forging Company, Grand Rapids, Mich., whose incorporation was announced last week, has announced plans for the erection of a one-story brick forge shop 50 x 100 ft. The company will manufacture steel forgings.

The Harbor Electric Company, Harbor Beach, Mich., has been incorporated with \$10,000 capital stock by J. G. Kiah, Charles H. Frame and B. B. Huestes. The company will take over an existing plant which will be completely modernized.

The Kalamazoo Mfg. Company, Kalamazoo, Mich., has been organized with a capital stock of \$20,000 and will engage in the manufacture of electrical devices.

The Gear Grinding Machine Company, Detroit, is extending its plant facilities so as to meet the growing demand for its product.

Milwaukee

MILWAUKEE, WIS., March 31, 1913.

March business in the Milwaukee district shows a considerable improvement over February, and the gain over the corresponding period a year ago is even more appreciable. Tool builders have their hands full and the next three months are well taken care of so far as a continuance of the present activity is concerned. Flood, fire and tornado in Nebraska, Indiana and Ohio have had a distressing effect on Milwaukee people and manufacturers. So far as cold business is concerned, the disasters will hardly affect the local shops adversely. Indeed, it is not unlikely that the misfortunes will create additional new business when the work of reconstruction begins. Weather conditions in and around Milwaukee have become somewhat more settled as the season advances and local requirements will grow correspondingly heavier in April. No exceptional lists have been put out for figures. The Soo line will probably require about \$25,000 worth of miscellaneous tools and equipment for its principal Wisconsin headquarters and shops at North Fond du Lac before the end of May.

The Aluminum Goods Mfg. Co., Manitowoc, Wis., has awarded the general contract for the erection of a \$45,000 addition to its works at the Worden-Allen Company, Milwaukee. Construction work will begin April 4. C. H. Tegen is architect.

The Koban Mfg. Co., Milwaukee, has been incorporated with a capital stock of \$25,000 to manufacture machinery. Leo F. Nohl, who appears as the principal incorporator, says the company will not be ready to make announcement of his plans until the middle of April at the earliest.

August F. F. Uttecht, for several years office manager of the American Oxhydic Company, Milwaukee, has resigned and organized the American Welding & Mfg. Company, with a capital stock of \$10,000, and proposes to establish a shop for welding and cutting metals, deal in supplies and generating apparatus, and create a special department which will give 24-hour service to machinery users requiring emergency welding or cutting work. The officers of the company are Frank A. Uttecht, president; Samuel H. Smith, vice-president, and A. F. F. Uttecht, secretary and treasurer. Mr. Smith has been associated with the American Oxhydic Company also, and will be mechanical director of the new shops. The company has leased a building at Clinton and Reed streets, with options for increased floor space.

The Aluminum Castings Company, Cleveland, Ohio, operating numerous aluminum foundries throughout the country, has practically closed negotiations for the relocation of the present works at Manitowoc, Wis., at

Racine, Wis. Options have been taken on a 6-acre tract at Lakeside, near Racine, and it is stated that approximately \$125,000 will be expended in buildings and equipment at once. The Manitowoc plant has been idle since February 1 because of unfavorable labor conditions.

The plant of the Waukesha Malleable Iron Company, Waukesha, Wis., was damaged about \$5,000 by a windstorm on March 24 and 25. The damage has already been repaired and the production is uninterrupted.

A. R. Kipp, mechanical superintendent of the Chicago division of the Minneapolis, St. Paul & Sault Ste. Marie Railway Company, with headquarters at North Fond du Lac, Wis., has scheduled his needs for 1913 for the car, locomotive and repair shops at North Fond du Lac at \$25,000, practically all being for tools and other equipment. No new machinery has been installed at North Fond du Lac since 1909. The list includes \$7,000 for new boilers; \$5,000 for the machine shops; \$5,000 for blacksmith shop; \$500 for tin shop; \$4,500 for car shop; \$1,500 for repair shop, and \$3,000 for air compressors at various points on the division.

The Big Four Construction Company, Milwaukee, Wis., has been organized to do a general steel and concrete construction business. The capital stock is \$5,000 and the incorporators are Edgar P. Lincoln, Jose E. Schultz and H. O. Townley.

Indianapolis

INDIANAPOLIS, IND., April 1, 1913.

The Common Council of Gary, Ind., has named a commission to consider the advisability of digging a ship canal from Gary Harbor to the Little Calumet River, at an estimated cost of \$2,000,000. The soil excavated will be used for a proposed \$250,000 park.

The Sano-Kleen Bath Company, Alexandria, Ind., has been incorporated, with \$50,000 capital stock, to deal in bath outfits. The directors are William T. Baker, J. Carson, Thomas E. Woodward, Rudolph V. Zimmerman and Alva N. Harold.

The Plymouth Electric Light & Power Company, Plymouth, Ind., has been incorporated, with \$100,000 capital stock, to operate an electric light plant. The directors are C. D., V. and I. Snoeburger.

The Seiffert Electric Company, Evansville, Ind., has been incorporated, with \$10,000 capital stock, to deal in general electric supplies. The directors are F. W. Seiffert, F. W. Stocker and L. H. Seiffert.

The Cochran National Broom Company, Indianapolis, with \$15,000 capital stock, has been incorporated, to manufacture machinery for making brooms. The directors are A. J. Cochran, O. C. Pierson and D. C. Trent.

The Duncan Electric Mfg. Company, LaFayette, Ind., is preparing to build an additional four-story building which will double its present capacity. New equipment will be required.

The Poole-Bosworth Mfg. Company, Crawfordsville, Ind., is building a two-story addition to its factory, 25 x 125 ft. It is intended for the installation of additional machine equipment.

The Hercules Buggy Company, Evansville, Ind., has taken over the business of the Holm's Machine Mfg. Company, Sparta, Mich., manufacturer of gasoline engines. It will erect a new factory in Evansville and transfer all of the equipment and machinery from the plant at Sparta. Some new equipment will be required but plans are not yet in shape for details.

The Faultless Caster Company, formerly of Nebraska City, Neb., is moving its plant and business to Evansville, Ind., where it will operate in a new building affording greatly increased facilities by May 1.

Wheeling

WHEELING, W. VA., April 1, 1913.

The Opperman Coal Company, Seng, W. Va., has been incorporated with \$50,000 capital stock to develop coal and timber lands in McDowell County, W. Va., and manufacture coke. The incorporators are J. H. Opperman, Cambridge, Ohio; Thomas E. Richards, C. Riggs, A. C. Orcutt and S. G. Campbell, of Seng, W. Va.

Work is progressing rapidly on improvements at the Big Run mine of the Rail & River Coal Company, south of Bellaire, Ohio, which will cost \$400,000. The old machinery is being replaced by modern electrical machinery. A 450-hp. boiler, purchased of the Fidelity Company, Scranton, Pa., has been installed, a new engine from the Harrison Company, Columbus, Ohio, and a new dynamo and fan for the air shaft from the Robinson Company, Columbus.

The Kay Salt Company, Charleston, W. Va., has been incorporated with \$125,000 capital stock to drill for salt and operate plants in Ecorse, Wayne County, Mich. The incorporators are James Kay, M. T. Roach, Guy M. Deane, E. R. Calloway, of Charleston, and J. J. Kean, of Detroit, Mich.

F. Vernon Aler, Martinsburg, W. Va., has completed arrangements for building a large brick plant near Martinsburg, which will be financed by Baltimore capitalists. The company has acquired 90 acres of land for a plant.

The Central South

LOUISVILLE, KY., March 31, 1913.

For the second time this year Louisville is suffering from a flood, the Ohio River having risen higher than ever before in the history of the local weather bureau. A large number of manufacturing plants here and in New Albany, Ind., across the river, have been flooded, while in the surrounding territory of southern Indiana and Kentucky flooded streams have delayed transportation and interrupted mail service so that the amount of business transacted is almost nil. Further south business conditions are normal, but the Mississippi Valley territory will feel the effects of the Ohio River flood within a short time. No mail from the East was received last week on account of the disastrous floods in Ohio and Indiana, and this territory was likewise cut off from Chicago and the West for the most part. Consequently machinery business, as well as trade in other lines, has been handled under difficulties. It is believed that as soon as the effects of the high water are dissipated the volume of business will be up to expectations, as there are plenty of prospects, especially among the smaller municipalities, which are planning improvements in the way of water and light plants.

C. H. Lambert, formerly connected with the W. J. Gillette Mfg. Company, of this city, is considering the establishment of an automobile factory here. Details as to location and other features will be decided upon shortly.

The Washburn Lumber Company, Washburn, La., has announced that a large sawmill will be built there to take the place of that recently burned.

The Richmond Dairy Company, Richmond, Va., will erect a dairy to cost \$61,000. A large amount of equipment for the plant will be needed.

The Kentucky Utilities Company, Lexington, is making extensive improvements in the gas plant at Shelbyville, Ky., which it recently purchased. Much new machinery is being bought. It has also purchased the electric light plant at Elizabethtown, Ky., has applied for a new franchise which will enable it to furnish current for power. The plant is to be enlarged and a pump installed for the operation of the water system as well.

The Sebree Light & Milling Company, Sebree, Ky., has been organized with \$20,000 capital stock by John B. Ramsey, J. J. Korb and M. J. Ramsey. An electric light plant is to be installed.

The Williamstown Mill & Light Company, Williamstown, Ky., has let a contract to Ellis King, Falmouth, Ky., for the installation of an electric light plant, including a street lighting system. J. M. Riley, J. W. Shields and others are members of the company, which has \$15,000 capital stock.

Wesley Wright, of Wright & Chase, Jenkins, Ky., is planning the installation of an electric light plant at Whitesburg, Ky., which is in the recently opened coal district of eastern Kentucky.

Dr. Elmer Northcutt, representing Chicago interests, is planning to install an electric light plant and water-works in Irvine, Ky., in the near future. The Town Council has agreed to create the necessary franchises.

The American Metallic Packing Company, Lexington, Ky., is in the market for a used engine lathe. The desired dimensions are 38 to 44-in. swing, with a 15 to 18-ft. bed.

New boilers and a new engine are to be purchased for the waterworks of Danville, Ky., the City Council having authorized the Mayor to buy the equipment. Probability of improvements being made was reported in *The Iron Age* recently.

Elevator men are much interested in the new building of the Fayette National Bank, Lexington, Ky., which is to be equipped with three electric traction elevators. The contract for the elevators will be placed in the immediate future.

The Hercules Mfg. Company, Chattanooga, Tenn., has leased a new building and will probably add to its capacity. It manufactures acetylene gas machines.

The Evans Motor Car Company, Nashville, Tenn., has been incorporated with \$50,000 capital stock by R. H. Evans, Everett Philpot, C. C. Woodcock and others, and will build a factory on the Gallatin pike near Nashville. Plans for the buildings have been drawn.

Gleason, Tenn., is considering the construction of an electric light plant. Bonds probably will be issued.

Holland & Moore, Burns, Tenn., plan the installation of a large sawmill at or near that point. They have secured a considerable acreage of hardwood timber.

Hart & Gardner, Nashville, Tenn., are architects for a four-story mercantile building to be erected by Dr. G. C. Savage. An elevator will be required, as well as a steam heating plant.

The Forest Products Company, New Orleans, La., has been incorporated with \$5,000,000 capital stock for the operation of plants to utilize the waste from yellow pine sawmills. Plants will be installed in connection with various mills in the South. James D. Lacey, New Orleans, is president of the company.

Lafayette, La., will receive bids until April 9 on the installation of additional machinery in its electric light and water plants. Harold Raymond, New Orleans, is engineer in charge.

The St. Petersburg Investment Company, St. Petersburg, Fla., has asked for bids for an electric power plant that will cost \$100,000.

The Southern Utilities Company, Jacksonville, Fla., is being organized to take over and operate ice factories, electric plants and other industries acquired by the Engineering Securities Corporation, New York. J. G. White, of J. G. White & Co., New York, is president of the Engineering Securities Company. The plants secured are located in Bradentown, Fort Myers, Fort Lauderdale, Tarpon Springs, Live Oak, Sanford, West Palm Beach, Lake City, Pensacola and Fernandina. Extensive developments are planned.

Birmingham

BIRMINGHAM, ALA., March 31, 1913.

Extreme activity at coal mines and ore and rock quarries as well as in foundries in the South has compensated for embarrassment in operation of sawmills and railroad work, resulting in a fair machinery and machine tool business, in spite of local handicaps. Conditions are generally good and the outlook for the spring is excellent.

The Tifton Foundry & Machine Company, Tifton, Ga., will enlarge its plant and install special machinery for the manufacture of harrows. It will increase its capital stock from \$25,000 to \$50,000.

J. V. Castleberry will establish a bottling plant at Lumpkin, Ga.

Joseph F. Gray, Savannah, Ga., Chamber of Commerce, is negotiating with Boston parties with a view to establishing a box factory.

The Florida Fruit Package Company, Lakeland, Fla., will establish a crate and box factory. P. S. Stokes is secretary and treasurer.

Jesse Scoggins and associates have organized a company with \$10,000 capital at Armuchee, Ga., to establish a coöperage plant.

Godfin, Reid & Co., Cincinnati, Ohio, have bought the Estelle cotton mills at Selma, Ala., and will invest \$75,000 to \$100,000 in new equipment.

The Ashcraft Cotton Mills, Florence, Ala., contemplates erecting a cotton seed oil mill at Hurtsboro, Ala.

A \$75,000 gas plant will be established in Dothan, Ala., by J. U. Cureton, Dothan; W. H. Harrison, Mansfield, La.; H. D. Williams, Birmingham, Ala., and Mr. Lewman, Philadelphia.

W. Jordan Massee and associates will establish a gas plant at Macon, Ga.

The city of Tallahassee, Fla., will vote April 15 on an issue of \$9000 of bonds to establish a gas plant.

Milner Brothers, Barnesville, Ga., will double the capacity of their ginnery; a contract for an 8-gin outfit has been let to the Lummus Cotton Gin Company, Columbus, Ga.

The Mandeville Mills, Tallapoosa, Ga., will reestablish the ginnery destroyed by fire. The capacity will be 40 bales.

C. E. Murray, Decard, Tenn., will establish a heading mill at Guntersville, Ala.

The Universal Ice Company, Birmingham, Ala., will establish an ice plant at Marion, Ala.

The city of Roanoke, Ala., will vote on May 1 upon an issue of \$20,000 of bonds for enlarging the electric lighting plant.

The Kilby Locomotive & Machine Works, Anniston, Ala., will erect an addition to its plant 60 x 60 ft., of steel construction. It will be used for axle forging.

The Louis Werner Stave Company, Shreveport, La., contemplates erection of a lumber plant on a tract of 6000 acres of land just purchased at Seville, Ga.

The Sylacauga Lumber Company will rebuild its plant recently burned at Sylacauga.

The Albany Power & Mfg. Company, Albany, Ga., J. E. Sirrene, Greenville, S. C., president, will install \$20,000 worth of machinery in steam power plant, increasing its capacity to 2000 hp. E. S. Killebrew is superintendent.

John W. Corr, Gordo, Ala., will establish a planing mill at Tuscaloosa, Ala.

Harry M. Creager, Cincinnati, will establish a syrup mill on a 300-acre tract recently purchased in Escambia County, Ala.

The Rome Tannery, Rome, Ga., will increase the capacity one-third, expending \$50,000 in new equipment.

The Central Alabama Veneering Company, Mobile, Ala., has been incorporated with a capital stock of \$10,000 by W. J. Leppert, Camden, Ala.; S. K. Taylor and M. C. Sherman, Mobile, to do a general lumber, timber and veneering business.

Fire at Shreveport, La., caused about \$30,000 damage to the plant of the Shreveport Gas, Electric Light & Power Company.

St. Louis

ST. LOUIS, MO., March 31, 1913.

The machine tool market has been rather quiet the past week. Business continues chiefly on single tools and small orders, with some replacements and some call for second-hand machine tools.

William Priesmeyer, of St. Louis, Mo., has plans for the construction and equipment of a two-story machine shop at 3033 Adams street.

The plant of the Granite City Lime & Cement Company, Granite City, Ill., opposite St. Louis, was burned the past week with a total loss of \$275,000, of which a considerable portion was on machinery.

The Dana Farmers' Elevator Company, Dana, Ill., with \$10,000 capital stock, has been incorporated by M. F. Bane, John B. Klendworth and George Klendworth, and will equip a grain elevator shortly.

The General Motors Truck Company, the Missouri corporation of the General Motors Company of Detroit, Mich., has taken out permits to build a large garage and repair plant in St. Louis.

The Vandalia, Ill., plant of the Ford Mfg. Company, manufacturer of roofing products, the largest of the three plants of the company, was burned March 23 with a loss of \$600,000 on buildings and machinery. The other plants are at St. Paul, Minn., and at Clinton, Iowa. President J. W. Ford, of St. Louis, is not yet ready to announce whether the plant and mechanical equipment will be replaced.

The Federal Lead Company, Alton, Ill., is building an addition to its smelting plant and also a \$15,000 bath house through which the employees will be required to ring in and out in entering and leaving the plant.

The Corrigan Rock Crushing Company, Kansas City, Mo., has been incorporated by F. J. Dwyer and E. J. and Edward Corrigan, and will equip a rock-crushing plant at once.

A power and heating plant to cost about \$50,000 is to be constructed as part of the new Catholic Cathedral now nearing completion at St. Louis. Barnett, Haynes and Barnett are the superintending architects.

The St. Louis, Affton & Sunset Hill Railroad Company, with headquarters in St. Louis, has financed an extension and enlargement of power capacity.

The Holladay Distillery Company, Kansas City, Mo., with \$25,000 preliminary capital stock, has been incorporated by D. S. Seaton, Frank Shearer and J. H. Smith to equip a distilling plant.

A fruit and vegetable cannery is planned to be constructed at Olvey, Ark., by Charles Trease.

The Clark Pressed Brick Company of Malvern and Little Rock, Ark., has plans for the installation of a producer gas kiln and other equipment at Malvern for the manufacture of common and pressed brick.

The Missouri Staple Cement Products Company,

Kansas City, Mo., with \$12,000 capital stock, has been incorporated by D. F. McCarty, R. H. DeWeese and Herschel Mastin. It will equip a plant for the manufacture of cement articles.

A plant for the construction of reinforced concrete silos is to be built by J. W. Maney and E. H. Linzee at Oklahoma City, Okla.

The Harrison Electric & Ice Company, Harrison, Ark., has plans for the installation of \$35,000 additional equipment, including a 5000-lamp dynamo.

Under the direction of W. A. Calhoun, engineer, the Kentucky Southwestern Electric Railway, Light & Power Company will build a power plant and substations to cost about \$160,000. The engineer's headquarters are at Paducah, Ky.

The city of Lafayette, La., will receive bids until April 9 for the additional electric and water works plant equipment, recently noted. Harold Raymond, New Orleans, is engineer.

The damage recently reported to the Shreveport Gas, Electric Light & Power plant will be repaired at once, under the direction of A. G. Curtis, general manager.

The electric plant at Hattiesburg, Miss., under the management of C. Z. Stevens for New York capitalists, will install much new equipment including 1800-hp. turbine, 200-kw. generator and other machinery.

A franchise for an electric plant at Springfield, Mo., has been granted to J. H. Rathbone, Roy Cox and M. C. Baker, who will construct at once following an approval vote at a public election April 1.

A bond issue of \$25,000 has been voted at Bristow, Okla., to be expended upon an electric light plant under the direction of the mayor.

The Boynton Oil Gas & Fuel Company, recently incorporated at Muskogee, Okla., by John H. Mosier and others, is building a pipe line and is in the market for machinery for use in the company's development work.

The Calvin Light & Fuel Company, Calvin, Okla., with \$40,000 capital stock, has been incorporated by J. W. Hundley, W. T. Anglin and O. M. Murray of Calvin and F. D. Oiler of Tulsa, and will construct a plant shortly.

The Spear-Hart Oil Company, Little Rock, Ark., with \$20,000 capital stock, has been incorporated by Henry Spear, H. Van E. Hart and others to equip property controlled by them.

The Dunn-Swart Oil, Gas & Mineral Company, Guthrie, Okla., with \$45,000 capital stock, has been incorporated by W. M. Swart, George L. Kuhn of Guthrie, J. L. Dunn, Dunn's Station, Pa., and others, and will equip and develop oil property.

The Alert Oil Company, Oklahoma City, Okla., with a capital stock of \$30,000, has been incorporated by R. M. Conway, E. R. Houghton and H. B. Houghton to equip and develop property.

The Kingland Oil & Gas Company, Oklahoma City, Okla., recently reported incorporated by C. E. King and others, will open bids April 15 for equipment for the oil property controlled by the company whose capital is \$45,000.

The Nebo Oil & Gas Company, Oklahoma City, Okla., with \$25,000 capital stock, has been incorporated by L. H. Prichard, B. W. Griffith, Jr., and D. A. Duncan, and will develop property controlled by the company.

The Drew Oil Mills, Monticello, Ark., has plans for the installation of a 20-ton ice plant in connection with its cotton seed products plant.

The Rock Island-Frisco Terminal Company, St. Louis, W. C. Nixon, president, has plans for the building of a fruit depot to be equipped with cold storage facilities of 750 car loads capacity.

The Fort Smith Iron & Steel Company, Fort Smith, Ark., will build a plant for the production of bar iron and steel. J. W. Arnold is president; M. W. Murray, secretary, and John H. Vaughn, vice-president.

The Northern Lumber Company will increase the mechanical equipment of its plant at Batchelor, La.

The Pine Products Company, Slidell, La., will double the capacity of its plant for the production of tar, turpentine, etc., from yellow pine waste.

The Louisiana Lumber & Mfg. Company, Ruston, La., has purchased and will rebuild as well as enlarge the plant of the Short Leaf Lumber Company at that point.

R. H. Sutton and Wesley Davis will install a saw-mill of 30,000 ft. daily capacity and also a planing mill at Ruston, La.

The Coney Lumber Company, Baxterville, Miss., with \$100,000 capital stock, has been incorporated by E. O. Coney and others, will equip a saw mill of 40,000 ft. daily capacity, a planing mill, dry kilns, etc.

A saw mill, power plant, machine shop and allied equipment will be built at Houlika, Miss., by the Ferguson-Palmer Company, Paducah, Ky.

A 75-ton garbage and refuse incinerator to cost about \$42,000 is to be built for the city of Kansas City under the direction of the board of public improvements.

The Louisville & Nashville Railroad, under the direction of Chief Engineer W. H. Courtenay of Louisville, Ky., has plans for the equipment of a tie creosoting plant at Guthrie, Okla.

A folding case factory is planned for Jonesboro, Ark., by W. R. Vaughn and F. M. Steuteman of St. Louis, Mo., who are negotiating with the Jonesboro Business Men's Club.

The Old Terrell Distillery Company, Paducah, Ky., will rebuild the distillery recently reported burned.

The Coleman Churn Operating Mechanism Company, Paducah, Ky., with \$24,000 capital stock, has been incorporated by W. H. Coleman and others to manufacture a patented churn mechanism.

The Maryville, Mo., waterworks plant improvements recently noted will cost about \$50,000 and the work will be under the direction of Hiram Phillips of St. Louis and S. G. Gillam of Maryville. The city is already in the market for the necessary machinery.

W. W. Cate of the Bank of Jonesboro, Ark., will build a stave plant at Blytheville, Ark. The Blytheville Cooperage Company, with \$15,000 capital stock, has been formed for the purpose.

The city of Monticello, Ark., is in the market for equipment which will perfect the sewage purification system now in operation in that city. The equipment is to be bought under the direction of E. B. Wells, chairman of the committee in charge.

A waterworks plant to cost about \$75,000 will be built at Monroe, Mo., under plans being prepared by Burns & McDonnell, of Kansas City, Mo., with offices in the Scarritt Building.

Plans have been completed by the Pioneer Pole & Shaft Company, Camden, Ark., under the management of Hugh Ford, for the construction of a mill building and the construction of a circular sawmill plant, together with other necessary equipment, for the manufacture of poles, etc.

Texas

AUSTIN, TEX., March 29, 1913.

In anticipation of another large cotton crop, many new cotton gins are being erected in different localities. Several new cotton-seed oil mills and compresses are also projected. The demand for irrigation machinery continues brisk. With the development of the subterranean shallow water belt in western Texas by means of wells and pumping plants, a large demand is being created for this class of machinery.

The Winter Garden Irrigation Company, which has a capital stock of \$100,000, will construct a large system of irrigation near San Antonio. The men interested are Alexander Boynton, William George and M. E. Lindheimer.

The Hearne Oil & Gas Company is preparing to exploit the section around Hearne for oil.

S. B. Killbower will erect an 8-stand cotton gin at Lytle.

The Bishop Ice & Gin Company has begun the erection of buildings for its proposed new 15-ton ice factory and 8-stand cotton gin at Bishop.

Preparations are being made for the creation of a complete drainage district near Aldine, and the construction of a system of drainage canals and ditches. About 60,000 acres are embraced in the project.

R. R. Austin and associates will build a cotton-seed oil mill at Austwell. It will cost about \$65,000.

The Refugio Land & Irrigation Company is erecting a new cotton gin at Tivolo.

The City Council of Nacogdoches has purchased the electric light and power plant of the Nacogdoches Light & Power Company. The property will be improved and enlarged.

The Slavonic Association of Taylor will build cotton gins at Granger, Circleville and other points in Williamson County. Joe Cuba is president of the organization; Thomas Drozda, vice-president, and J. P. Mohel, secretary.

George Kuncze will build a cotton gin at Charlotte. S. H. Ridgeway is erecting a cold storage plant at Charlotte.

W. Thompson and J. McCallum are building a cotton gin at Tabor.

The Farmers' Union Gin Company will build a cot-

ton gin at Somerset. L. S. Morrison, Charles Fischer and A. L. Pyron are interested.

The Dallas Chamber of Commerce is agitating the construction at Dallas of a municipal electric light plant to cost about \$375,000. At a recent meeting of the organization the subject was discussed, but no definite action has yet been taken.

The Port Arthur Gas Company has been organized at Port Arthur with a capital stock of \$100,000 for the purpose of constructing a gas manufacturing plant and laying a distributing system. The incorporators are J. S. Connelly, J. H. Eubank and George McCraig.

The San Antonio Engineering & Construction Company, San Antonio, has been organized. The incorporators are J. C. Neely, C. E. McStravick and W. B. Riddell.

The Eugene Ashe Electric Company, Fort Worth, has been organized. The incorporators are Eugene Ashe, S. Ashley and C. L. Clements.

The Pacific Coast

PORTLAND, ORE., March 25, 1913.

The general demand for machine tools throughout the north Pacific coast shows considerable improvement, due rather to the number of small buyers coming into the market than to large single purchases. A few orders for single tools of a heavy nature have, however, been placed by railroads and other large buyers. Small inquiries from the garage trade are increasing in number, and there is a fair amount of business from shops connected with the lumber and other industries. Altogether, the situation is encouraging, with prospects of heavier buying in the next two months.

The demand for logging, sawmill and woodworking machinery is growing rapidly, and an excellent year is expected in this line. New timber land is being developed on a large scale, and plans for a number of new mills have been announced within the last fortnight, while the older mills are steadily in the market for miscellaneous supplies. A fair volume of business is coming out in connection with public service improvements, and considerable work is being done in the way of road and railroad construction, quarry development, etc. The Alaska fishing fleets are now being dispatched, and deliveries of canning devices for their use are heavy. Many orders are also reported for fruit cannery, evaporating and packing outfits.

The Hunt Mfg. Company, Walla Walla, Wash., has been incorporated with a capital stock of \$300,000 by Allen H. Reynolds, W. P. Reser, M. Tower, B. M. Huntington and W. R. Paxton, to succeed the Gilbert Hunt Company, manufacturing traction engines, implements, etc. It is understood that the business will be materially enlarged.

The Powder River Gold Dredging Company is considering the construction of a new gold dredge to operate on the upper Powder River, near Baker City, Ore.

Negotiations are under way for the enlargement of the Portland Cement Company's mill at Oswego, Ore., to a capacity of 2000 bbls. daily.

M. Barde & Son, Portland, have taken over the transmission machinery department of the Wilamette Iron Works.

The Washington-British Columbia Steel Corporation, Tacoma, Wash., has been incorporated with a capital stock of \$5,000,000 by C. H. Eckart, L. E. Kirkpatrick and others.

The Yaquina Electric Company is preparing to enlarge its plant at Newport, Ore., putting in a 150-hp. boiler and other equipment.

The Mutual Milling Company is preparing to build a sawmill of 60,000-ft. daily capacity at Chiloquin, on Upper Klamath Lake, Oregon.

The Weyerhaeuser Lumber Company has announced plans to build two mills at Everett, Wash., at an estimated cost of \$700,000.

Yakima County, Wash., is figuring on the installation of a No. 6 gyratory rock crusher and a No. 3 auxiliary crusher, with electric motor drive.

The Olympic Ice & Machinery Company, Tacoma, Wash., has taken contracts for a 40-ton ice machine for A. Blodgett & Co., Puyallup, Wash., and a 6-ton machine for Moise & Michie of South Tacoma.

The Hercules Sandstone Company, Tenino, Wash., is adding a complete stone cutting department to its quarry, at a cost of about \$20,000. The equipment includes two 30-ton electric hoists, a 15-ton traveling crane, a 20-ton derrick and a locomotive crane.

The Weed Lumber Company, Weed, Cal., is adding a lot of new equipment to its machine shop.

W. Walter and Y. Fraser have taken over the Enterprise Machine Works, Lakeport, Cal.

The Jack Burnett foundry, Fresno, Cal., suffered a fire loss of about \$12,000 March 21. The principal damage was in the pattern shop.

Eastern Canada

TORONTO, ONT., March 29, 1913.

The John Goodison Thresher Company, Ltd., Sarnia, Ont., states that the recent reports of the fire in its premises greatly exaggerated the damage done. The loss was confined to the cupola house in connection with the molding shop, the damage being less than \$1,000. The molding shop was shut down for one day only.

Federal incorporation has been granted to the Sovereign Cotton Mills, Ltd., Toronto, with a capital stock of \$6,000,000.

The Canadian Wire Company, Ltd., Montreal, has been incorporated with a capital stock of \$500,000 to manufacture and deal in iron, steel and wire of all kinds.

The Dominion Chain Company's branch plant at Niagara Falls, Ont., will be completed in about two weeks. It will manufacture all kinds of steel chains, including the Weed chain for automobile tires. It is quite possible that the main factory will be established there.

In order to provide for the increased demand for power the Hydro-Electric Commission will increase the capacity of the transformer station at Berlin, Ont., from 3000 to 5000 hp., which will enable the local commission to increase the load by 1300 hp. this year.

The Bell Telephone Company of Toronto has secured a permit for the erection of a \$34,000 brick and steel telephone exchange, to be built on Bathurst street.

T. Aird Murray, C.E. Toronto, has submitted plans for a \$60,000 sewage disposal plant for Peterborough, Ont.

The John Inglis Company, Toronto, has been incorporated with \$1,000,000 capital stock to manufacture engines, boilers and machinery of all kinds.

The milling room of the Standard Sanitary Mfg. Company, Toronto, was damaged by fire to the extent of \$2,000.

A new industry is practically assured for Guelph, Ont., in the shape of a branch of the R. Laidlaw Lumber Company of Toronto. The site will be the old rolling mill property in St. Patrick's Ward, which the company is purchasing from the city. It will erect a planing mill and sash and door factory.

Fire in the Canadian Oil Company's factory at Elmwood, Man., did damage to the extent of \$15,000.

The stockholders of the Lozier Motor Company of Toronto have authorized an increase in the capital stock from \$3,000,000 to \$5,000,000.

The Quality Furniture Makers, Ltd., Welland, Ont., has been incorporated with a capital stock of \$40,000, to manufacture leather upholstered furniture, mattresses, etc. The company has secured the plant formerly occupied by the Hamilton Tube Works on Patterson avenue, which it will equip at once. It is expected a portion of the plant will be in operation by May 1. A large addition to the present building will be built later. The provisional directors are B. J. McCormick, H. L. Hatt and L. C. Raymond, Welland, and Alexander McLaughlin, Toronto.

The Stratford Mill Building Company, Ltd., Stratford, Ont., will build a new plant to cost about \$80,000, to replace the buildings recently destroyed by fire.

Plans are in preparation for an additional building approximately 200 x 350 ft. to be erected at the plant of the Watrous Engine Company, Brantford, Ont., manufacturer of fire engines, etc.

Government Purchases

WASHINGTON, D. C., March 31, 1913.

The Paymaster General, Navy Department, Washington, will open bids April 22, under schedule 5253, class 1, for one vertical boring and turning mill.

The Commissioners of the District of Columbia, Washington, will open bids April 14 for furnishing and installing a new boiler and rebuilding engine for use in the fire department.

The office of the commanding officer, Springfield Armory, Springfield, Mass., will open bids April 15 for a new boiler plant to consist of two 400-hp. boiler units, each unit composed of two 200-hp. boilers.

The Isthmian Canal Commission, Washington, will

open bids April 15, under circular 769, for furnishing 56 induction motors, 43 auto starters and three automatic oil switches.

The daily consular reports, issued by the Bureau of Manufactures, Department of Commerce and Labor, Washington, give a number of foreign trade opportunities for machinery and equipment. Detailed information may be obtained from the department. Abstracts of these inquiries are as follows:

No. 10,446—Communications are desired from American manufacturers of ventilators, pumps and spraying apparatus with a view to establishing an agency.

No. 10,449—A firm manufacturing pharmaceutical preparations wishes to buy machinery for such manufactures.

No. 10,455—A foreign government desires to secure literature and catalogues concerning motor boats for use as revenue cutters.

No. 10,457—An American consul in Mexico has been requested to ascertain particulars of internal combustion oil motors or engines which will operate with Mexican crude oil.

No. 10,458—A manufacturer in France is anxious to get in touch with American manufacturers of furnaces. He has furnished a catalogue showing types of furnaces desired, which can be obtained from the Bureau of Foreign and Domestic Commerce.

No. 10,482—An American consular officer in an European country has an inquiry for molding machines for casting piano frames with straining pins for the strings in place.

No. 10,491—The Cradock Divisional Council is asking for tenders for supplying internal combustion traction engines of not less than 50 brake horsepower.

No. 10,492—Contractors in the Near East are interested in machinery suitable for pumping water; hot air, gasoline or kerosene power preferred.

The Bureau of Supplies and Accounts, Navy Department, Washington, will open bids April 8, under schedule 5252, for one cold bend testing machine and under schedule 5270, for one geared open-back power press, motor driven.

The Bureau of Supplies and Accounts, Navy Department, Washington, opened bids March 18 as follows:

Schedule 5215, class 1, for eight convertible steel plate exhausters and two complete sets of spare parts—Bidder 48, General Electric Company, Schenectady, N. Y., \$7,730; 84, New York Blower Company, Chicago, Ill., \$6,468; 106, B. F. Sturtevant Company, Hyde Park, Mass., \$7,946; 119, Diehl Mfg. Company, Elizabethport, N. J., \$7,813.

Schedule 5223, eight ventilating blower sets—Bidder 106, B. F. Sturtevant Company, Hyde Park, Mass., \$3,920; 112, Westinghouse Electric & Mfg. Company, Washington, \$2,388.70; 119, Diehl Mfg. Company, Elizabethport, N. J., \$3,500.

New Trade Publications

Boiler Tube Reseating Machine.—Lagonda Mfg. Company, Springfield, Ohio. Bulletin No. G-1. Describes the construction and use of a portable carborundum wheel for removing soot and scale from the faces of caps and tube ends on boilers. These wheels are driven by either electric, water, steam or air motors, and there are photographs showing the machine as well as the performance of actual operations. Mention is also made of the company's boiler tube cleaners, automatic cut-off valves and multiple strainers.

Portable Floor Crane and Hoist.—Canton Foundry & Machine Company, Canton, Ohio. Pamphlet. Lists the eight regular sizes of a portable floor crane and hoist as well as a number of special types that have been built. After a brief statement of the work for which this hoist is adapted and a description of its construction, it is shown in use in a number of different plants, followed by condensed specification tables of the various sizes.

Portable Forges.—Springfield Forge Company, Springfield, Ohio. Catalogue. Describes and illustrates the Cyclone line of portable forges, exhaust fans, blowers and drilling machines. This company is manufacturing the line of products formerly made by the Foos Mfg. Company and makes a specialty of machine shop forges.

Emery Wheel Dresser and Guard.—Challenge Machine Company, Inc., 5116 Springfield avenue, Philadelphia, Pa. Folder. Describes and illustrates the Gardi-Huntington emery wheel dresser which has a protecting hood to throw the grit and dust down instead of up. The wheel guard is made in a floor type and also in another style for attaching to the machine. An illustrated description of this guard appeared in *The Iron Age*, January 2, 1913.

Eye Protectors and Respirating Devices.—American Thermo-Ware Company, 16 Warren street, New York City. Pamphlet. Pertains to the Autocrat line of eye protectors and respirating devices. The protectors are made in numerous sizes and styles, all of which are illustrated and briefly described. The respirators are designed for use in occupations where dust and noxious fumes are given off by manufacturing processes. A general classification of occupational diseases and harmful substances is given, followed by measures for the protection of industrial workers against the dangers of poison and a list of emergency hospital and first aid equipment.

Trucks.—George P. Clark Company, Windsor Locks, Conn. Bulletin M. Illustrates and briefly describes a line of trucks for use in factories, mills and warehouses, as well as for use in handling dry goods, laundry and dyed goods. Among the special trucks illustrated is one for carrying the copper printing rolls used in

calico printing. All of these trucks are fitted with roller bearings, and a brief illustrated description of the type of bearing used is included.

Drilling Machines and Railroad Motor Car.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. One bulletin and two circulars. The first, No. E-28, superseding No. E-21, describes a line of portable electric tools, designed for use on 600-volt direct-current circuits. These include track and side and center spindle drilling machines, a portable grinding machine and a machine for driving screw spikes. The various machines are illustrated and a partial list of users is included. Circular No. 143 shows signal bonding outfit which has been designed for furnishing the current for operating electric drilling machines to prepare the holes for signal bonding on steam railroads. This outfit consists of a single-cylinder, four-cycle gasoline engine, directly connected to a 1¼-kw. generator. Circular No. 145 is concerned with a triple ignition motor car for use in either railroad section or inspection work.

Steam Turbines.—Connecticut Turbine Mfg. Company, New London, Conn. Pamphlet. Concerned with a line of turbines, which are built in sizes from 25 to 500 hp., for any speed range. The special advantages claimed for the turbine are an improved system of steam distribution and bucketing and the use of indestructible wheel buckets and non-corrosive return buckets. These special features, together with others, are briefly touched upon and the text is supplemented by exterior and sectional elevations, the latter having all the different parts numbered.

Core Sand Shakers.—Duplex Shaker Company, 1535 West Thirty-fifth street, Chicago, Ill. Folder. Concerned with a duplex shaker for use in the corerom and facing departments of a foundry. The shaker consists of two riddles placed opposite each other and connected to a crank shaft. Illustrations of the shaker are given together with a brief description of its construction. An illustrated description of this shaker appeared in *The Iron Age*, January 23, 1913.

Lathe Turret Head.—Meisselbach-Catucci Mfg. Company, 29 Congress street, Newark, N. J. Catalogue No. 3. Concerned with a turret head which is designed to be adapted to any bench or speed lathe readily, thus converting it into a screw machine. The main features of the turret head, which are its adaptability, automatic revolving and indexing, ability to handle delicate work and ease of engaging, turning and indexing the turret by hand, are all briefly touched upon. An illustration of the turret, which weighs 35 lb. and is provided with five spindles, having an extreme travel of 1 in., is included.

Humidity Control.—Carrier Air Conditioning Company of America, 39 Cortlandt street, New York City. Chart. Gives a means for finding the relative humidity in the air for various differences between wet and dry bulb temperatures. Attention is also called to the company's plants for humidifying, dehumidifying and cooling air; together with instruments for the automatic control of humidity and temperature, dry blast plants and air washers for public buildings.

Steam Separators.—Harrison Safety Boiler Works, North Philadelphia Station, Philadelphia, Pa. Engineering leaflet No. 14. Describes a remedy for water in compressed air, the means advocated being the use of a steam separator. The use of this device, it is pointed out, does away with the presence of water in compressed air, which results in freezing and interference with the operation of pneumatic tools, and, in some cases, the presence of oil which has been introduced by the lubrication of the air compressor cylinder and sometimes causes explosions of compressed air in receiving tanks.

Engineering Specialties.—Ashcroft Mfg. Company, 85 Liberty street, New York City. Catalogue F. Describes a full line of engineering specialties which includes steam, pressure, vacuum and recording gauges; engine indicators, clocks, revolution counters, pumps of various kinds, gauge glasses and pipe fittings and tools. In connection with the gauges descriptions of the various types are given followed by lists of the standard graduations and illustrations of the different styles with brief descriptions. All of the other specialties are illustrated and briefly described, a single page as a rule being devoted to each.

Brass Goods.—W. D. Allen Mfg. Company, 133 Lake street, Chicago, Ill. Catalogue No. 32. Relates to an extensive line of brass goods which includes sprinklers and fittings, hose couplings and nozzles, fire extinguishers, Siamese connections, hose racks and reels and grease and oil cups. Illustrations, brief descriptions and condensed tables of specifications are given for each specialty, and a comprehensive index occupies the last three of the pages of the catalogue.

Hack Sawing Machines.—W. Robertson Machine & Foundry Company, Buffalo, N. Y. Circular. Calls attention to the No. 1 and No. 3 Economy power hack sawing machines, which were illustrated in *The Iron Age*, October 10 and December 5, 1912, respectively. Illustrations of both machines are given, together with brief descriptions, and in the case of the No. 1 machine a condensed table of specifications is included.

Lock Washers.—Reliance Mfg. Company, Massillon, Ohio. Folder. Illustrates the various types of Reliance lock washers that are made for a number of different sizes of bolts. Lists of the sizes most commonly used for ordinary work are included.

